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REASONABLE RATES.

In England, and originally in the United States, the legislatures were supreme in the matter of rates for public service, and rates fixed by legislation were reasonable in law, however unreasonable in fact. The so-called Granges Cases, being the first rate cases decided by the Supreme Court of the United States under the Fourteenth Amendment, and including Munn vs. Illinois, 94 U. S. 113, and several others in the same term, went on the ground that the state legislature was supreme in the matter of rates, and that the Court had no right to interfere. Chief Justice Waite used the following language in the opinion of the Munn case, where seven of the nine justices supported the validity of an Illinois statute that fixed the rates for storing grain at Chicago:

"It is insisted, however, that the owner of property is entitled to a reasonable compensation for its use, even though it be clothed with a public interest, and that what is reasonable is a judicial and not a legislative question.

"As has already been shown, the practice has been otherwise. In countries where the common law prevails it has been customary from time immemorial for the legislature to declare what shall be reasonable compensation under such circumstances, or, perhaps, more properly speaking, to fix a maximum beyond which any charge made would be unreasonable. * * * The controlling fact is the power to regulate at all. If that exists, the right to establish the maximum of charge, as one of the means of regulation, is implied."

The Munn case was decided in 1876, and between that date and the year 1889, when the Court rendered its opinion in Chicago Electric Railway Company vs. Minnesota, 134 U. S. 418, there were dicta in several cases to the effect that state regulation of rates might not be pushed so far as to destroy the value of property, and that the Court would give protection against such legislation. In the Minnesota case just cited it was for the first time squarely decided that the Court had the last word to say as to the reasonableness of a rate fixed by a legislature, and the opinion added:

"If the company is deprived of the power of charging reasonable rates for the use of its property, and such deprivation takes place in the absence of an investigation by judicial machinery, it is deprived of the lawful use of its property, and thus, in substance and effect, of the property itself, without due process of law, and in violation of the Constitution of the United States."

Since the above Minnesota case the Supreme Court has repeatedly stated its position to be that of protecting property

against unreasonable rates. In Chicago Electric Railway vs. Wellman, 143 U. S. 339, the Court said:

"The legislature has power to fix rates, and the extent of judicial interference is protection against unreasonable rates."

Mr. Justice Brewer thus stated the rule in Reagan vs. Farmers' Loan and Trust Company, 154 U. S. 632:

"The courts are not authorized to revise or change the body of rates imposed by a legislature or a commission; they do not determine whether one rate is preferable to another, or what under all circumstances would be fair and reasonable as between the carriers and the shippers; * * * but still there can be no doubt of their power and duty to inquire whether a body of rates prescribed by a legislature or a commission is unjust and unreasonable, and such as to work a practical destruction to rights of property, and if found so to be to restrain its operation."

In San Diego Electric Company vs. Jasper, 189 U. S. 439, where the rates fixed by supervisors for water were upheld, Mr. Justice Holmes said for the Court:

"In a case like this we do not feel bound to * * * proceed according to our independent opinion as to what were proper rates. It is enough if we cannot say that it was impossible for a fair-minded board to come to the result which was reached. * * * We do not sit as a general appellate board of revision for all rates and taxes in the United States. We stop with considering whether it clearly appears that the United States Constitution has been infringed * * *"

From the above citations it is plain that when the validity of rates fixed by a legislature is under consideration the Court is bound to use the constitutional minimum as the standard of reasonableness. As was pointed out before, this minimum may be just high enough to escape being confiscatory, but may be low enough indeed to paralyze the hopes of the investors.

Where the general question of reasonableness, apart from any act or constitution, is under consideration, a court may reach quite different results, as is illustrated by Canada Railway Company vs. International Bridge, 8 App. Cases 723, decided by the Privy Council of England in 1883. In an opinion holding the charges made for the use of the bridge to be reasonable, the Lord Chancellor said in this case:

"It seems to their lordships that it would be a very extraordinary thing indeed, unless the legislature had expressly said so, to hold that the persons using the bridge could claim a right * * * to ask a court to say that the persons who have projected such an undertaking as this, who have encountered all the original risks of executing it, who are still subject to the risks which from natural and other causes every such undertaking is subject to, and who may possibly, as in the case alluded to by the learned judge in the court below, the case of the Tay Bridge, have the whole thing swept away in a moment, are to be regarded as making unreasonable charges, not because it is otherwise than fair for the railway company using the bridge to pay those charges, but because the bridge company gets a dividend which is alleged to amount, at the utmost, to fifteen per cent. Their lordships can hardly characterize that argument as anything less than preposterous."

EXTRAORDINARY EXPENSES IN PUBLIC-SERVICE OPERATION.

In view of the prominence now given in various parts of the country to the problems of reasonable return for public-service corporations, all fresh evidence of the extraordinary expenses which must be sustained by companies from year to year in order to give good service is interesting and valuable. The principle is the same, regardless of the kind of utility one is considering. Every manager dealing with public authorities on rate questions owes it to his superiors and stockholders to emphasize the magnitude of the annual sums which in a well-operated property need to be set aside to cover depreciation, extraordinary repairs, obsolescence, and other abnormal costs which are independent of the ordinary run of traffic. Not a few utility companies have in late years gone to the wall because of their failure to appreciate the inexorable progress of decay and change in their properties. The municipal plant has been an arch sinner in this respect.

In a report just made public by the Massachusetts Highway Commission, Prof. D. C. Jackson, its consulting engineer, discusses an appraisal which has been made during the past twelve months of the property of the New England Telephone and Telegraph Company for the purpose of determining what is a fair return to the company for its service. Among other matters, the report discusses the extraordinary expenses which the company must meet from year to year, on the average, for reconstruction for the purpose of maintaining the plant against the ravages of age or obsolescence incident to inventions and other causes for improvements and changes in the field of telephony. This reconstruction is called for on account of several factors: The rotting of poles, so that they must be replaced, the deterioration of conduits, cables and wires, so that they must be replaced, and the other effects of the elements and of use on every part of the plant ultimately bring nearly all parts of the telephone system to a point where their further use is impracticable without rebuilding or replacement, however well cared for and carefully kept up by current repairs they may be. The part of the equipment affected must be bodily replaced. The advances occurring through improvements in the art also demand the remodeling or substitution of apparatus before the normal life of the initial installation has expired. A third and most important factor is the action of municipal or other public boards, who may order pole lines in first-class condition removed to alleys, or wires placed in underground conduit.

None of these factors can be cared for out of a uniform appropriation, such as may cover ordinary repairs; and the cost of making good after special attacks of the elements, such as damage of pole lines from sleet-storms, the effects of forest fires, etc., is still more capricious in its occurrence. Nevertheless, these expenditures must be made out of earnings year after year, or the investment of the company is bound to become impaired and the service suffer.

For this purpose the average rate of reconstruction likely to be required over an extended period of years must be figured on the basis of experience, and a corresponding sum should

be set aside annually. Less than this amount may be used in some years and more in others, but the amount to be taken from the gross receipts each year should be fixed upon an average determined by the extent and value of each kind of plant in the complete system. As a result of the investigation of the New England Telephone and Telegraph Company, percentages have been applied to each kind of construction involved, taking into account first cost, rate of depreciation, probable results of changes in the art, acts of municipal bodies, elemental disasters, and salvage from discarded equipment. In this way it was estimated that 7.3 per cent of the value of the company's property, exclusive of real estate, general supplies, net current assets and cash on hand, or a total of nearly two-and-one-quarter-million dollars a year should be set aside and devoted to extraordinary expenses. The total valuation of the company's property in Massachusetts was about $35,000,000 by the appraisal. It is clear that in this case the money needed yearly, on the average to meet the expenses discussed above, is by no means a small matter; and in the case of other companies whose plants and systems represent a large capital investment, it is plain that it will pay to take a good deal of trouble to show those who question the reasonableness of rates what proportions of the income ought to be set aside for these emergency uses.

SPECIAL RATES FOR ELECTRIC VEHICLE CHARGING.

As the electric vehicle movement gathers force and power the important question of rates to be charged for this service comes before many central stations. It is obvious that while the cost of electricity is often a comparatively small percentage of the total cost of operating an electric automobile, it is important in the mind of the prospective user of such a vehicle to secure as low a rate for this service as he can, particularly when he compares the cost of operating a commercial or pleasure vehicle installation by horses with one run by electric power. Central stations are rapidly coming to appreciate the fact that the vehicle charging load is exceedingly attractive when it comes off the lighting peak; in fact it tends to come off the principal power peaks or high maximum levels of the motor load curve through the prevalent practice of charging batteries at night.

Two classes of customers must be considered in taking up electric vehicle charging; the public garage and the private installation. The load provided by the former is naturally substantial in its demand upon the central station and may justify a somewhat lower rate than the single private consumer can expect to enjoy, just as the large power user secures his energy at a lower rate per kilowatt-hour than the small merchant with but one or two motors of moderate capacity. It is a common practice for the garage to quote a rate of ten cents per kilowatt-hour for transient automobiles, dropping down to perhaps six or eight cents to regular customers. In a large garage where considerable electric vehicle work is done a station rate to the garage of from three to five cents ought to bring in good returns, particularly if the work can mainly be done at night. Probably the garage cannot afford to charge automobile batteries under conditions of light business for much less than six cents per kilowatt-hour, but a small margin of profit and a large volume of business is what will best develop this promising field. The central-station man and the garage owner need to put their heads together in not a few cases, instead of each trying to obtain the highest possible unit rate for charging current. Many garage owners who handle principally gasoline machines take up the electric vehicle only as a matter of necessity. The profits on repairs on large gasoline touring cars are seldom realized in the maintenance of electric automobiles. It is not at all improbable that in the near future the garage devoted exclusively to electric vehicle service will capture the cream of the business in the larger cities. This means well for the central station which will be contented with reasonable unit rates at the proper hours; and it also means that the automobile owner will obtain the specialized care which is in reality necessary for the proper service of the electric vehicle.

The private customer should obtain the company's regular power rates at the least, if he maintains his own private charging installation. The development of the mercury arc rectifier, and particularly of the automatic type, is certain to be a force in the right direction in the electric vehicle field, through its elimination of public garage charges. While skill is necessary for the proper maintenance of the batteries and mechanical equipment of the electric automobile, and must be supplied either by the owner or by the specialized public garage, it is now a simple matter for anyone with a little instruction to charge an automobile in a private stable, and at a rate that not only is favorable compared with the commercial rates of the garages, but which may justify a special residential rate or a special commercial rate as the business extends. If the central station goes into the electric vehicle business from the standpoint of charging all the traffic will bear, so to speak, it will hinder the growth of electric automobile service. A reasonable profit, on the other hand, and a little effort to establish the proper charging equipment, will do much to benefit both the lighting company, the vehicle manufacturer, and the consumer.

RAMSAY ON TRANSFORMATION OF THE ELEMENTS.

On another page a communication from Sir William Ramsay presents some rather startling results of recent research and experimentation. Purified thorium nitrate, dissolved in water, was placed in a flask which was repeatedly evacuated until no gas could be pumped off. After standing for 168 days the gas in it was pumped out and examined for helium with doubtful results. A later example showed the presence of helium still questionable, but revealed a considerable trace of carbon-dioxide. A still later examination showed a distinct evidence of helium, and a still greater content of carbon-dioxide. It is thus possible that carbon is one of the degradation products of thorium. Sir William stated that every precaution was taken to exclude foreign gas, but no one was better aware than he how insufficient was the proof, and that many other experiments must be made before it could be confidently asserted that certain elements, when exposed to "concentrated energy," underwent degradation into carbon.

Heat Flow and Temperature Distribution in the Gas Engine.

Professor Bertram Hopkinson introduced the above subject before the Institution of Civil Engineers in London in February, and the discussion occupied several meetings. The paper, in abstract, is as follows:

In the course of the expansion and exhaust strokes of the gas engine, from a quarter to a half of the whole heat developed in the explosion is discharged into the cylinder walls. This flow of heat, though its effect on efficiency is relatively small, is very important in the practical working of the motor, because it necessitates the provision of special appliances for its removal from the outside of the engine as fast as it is generated within, and it also requires the existence of a temperature gradient sufficient to carry it from the place where it is generated to the place where it is removed.

In consequence, high temperatures must exist in the uncooled parts of the engine and great temperature differences between one part and another. These conditions give rise to dangers from pre-ignition, and also to large mechanical stresses in the metal, which, between them, account for a large part of the practical difficulties encountered in running large gas engines.

Given the rate of heat flow into every portion of the cylinder per square foot, it would be possible by a sufficiently elaborate mathematical analysis to calculate the distribution of temperature throughout the metal. Apart from the difficulty of the mathematical problem, however, the data for its solution are only imperfectly known, and a rough calculation of the general mean temperature distribution is all that is possible. Such a calculation is made in the paper, and leads to the conclusion that the temperature on the inner surface of portions of the engine which are efficiently water-cooled, such as the liner, can never rise above quite a moderate value. But the temperature at the center of an uncooled piston, twelve inches in diameter, may reach 400 degrees centigrade or more. It also appears that the temperature at the center of such a piston will vary as the square of the diameter if the thickness be kept constant, or directly as the diameter if the thickness be increased in proportion thereto.

The paper proceeds to describe experiments made upon a Crossley gas engine of forty brake-horsepower with the object of determining the actual temperature distribution and its relation to the conditions of working. The temperatures were measured by means of thermo-couples inserted into the piston face and into the centers of the valves.

In the first group of tests these temperatures were compared with the total heat loss as measured by the rise of temperature of the jacket water. According to theory, the excess of the temperature at any point over the mean temperature of the jacket water should be proportional to the total heat loss, except in so far as the distribution of that loss over the metal surface exposed to the hot gas is altered. By varying the strength of mixture, keeping other conditions the same, the heat loss was varied between limits of about 1,300 and 2,200 British thermal units per minute, the engine firing practically every time; and it was found that the piston temperature was very closely proportional to the heat loss. In the exhaust valve there was some deviation, the causes of which are discussed in the paper. Under normal working conditions at full load the temperature at the center of the piston was found to be about 370 degrees centigrade above that of the jacket water; in the exhaust valve, 400 degrees centigrade, and in the inlet valve 250 degrees centigrade.

From a comparison of the temperatures at different points in the piston face and the temperature at the center, the rate of heat flow into the face of the piston is deduced and found to amount to about one-eighth of the total flow into the engine. This agrees well, having regard to the difference of piston temperature, with the results obtained by Professor Burstall, who measured separately the heat given to a water-cooled piston. It is a considerably smaller proportion than would be expected. It is suggested that an important cause is to be found in the fact that the gas near to the piston is the last to be ignited in the course of the passage of the flame through the combustion space, and is therefore cooler than the average in accordance with a principle established by the author some years ago.

Of the fall of temperature between the center of the piston and the jacket water, about one-half, or say 180 degrees centigrade, is between the center and edge of the piston face. In consequence of this inequality of temperature there is a considerable hoop tension at the edge of the piston face. The magnitude of this is investigated and it is shown that it probably amounts to several tons per square inch. It is pointed out that uncooled pistons of large diameter will be likely to fail by a radial crack at the edge which, in many cases, may be followed by seizing of the piston on account of the sudden expansion which is thus permitted.

The next group of experiments relates to the effect of varying the conditions of running upon the metal temperature. The dependence of heat flow and temperature upon strength of mixture, time of ignition, and degree of compression are investigated.

(1) *Strength of Mixture.*—It appears that if the gas charge be increased by thirty per cent, the total heat loss will be increased by fifty per cent with a corresponding increase in the temperatures of the piston and inlet valve.

(2) *Time of Ignition.*—Retarding the ignition by twenty degrees, the gas charge and other circumstances remaining the same, reduces the total heat loss by ten per cent. The piston and inlet valve are twenty per cent cooler, these parts receiving a much less share of the heat than before. On the other hand, the exhaust valve receives a greater share of heat than with normal ignition, and its temperature is not materially altered. The thermal efficiency is reduced from 34.5 to 28.5 per cent.

Advancing the ignition by ten per cent has but little effect upon efficiency. It causes an increase of about ten per cent in the heat loss. There is a more than proportional increase in the temperature of the piston and inlet valve. The exhaust valve is again but little altered.

(3) *Degree of Compression.*—Comparative trials were made in which the engine was run first in the ordinary way and second with the half-compression cam, which is used for starting purposes, kept in action. The result in the latter case is that about two-fifths of the charge of gas and air is expelled unburnt to exhaust. In fact, the only thing changed is the density of the charge, all other circumstances remaining practically the same. It was found that heat loss was reduced nearly but not quite in proportion to density, with a corresponding reduction in the temperatures of all parts of the engine. The effect of degree of compression upon efficiency and upon the practical working of the motor is discussed in the light of these observations.

Another set of experiments consisted of comparative trials with the engine running on half-load, so that every other cycle was a scavenging cycle, and firing

every time, the circumstances being otherwise the same. It was found that the quantity of heat removed by the air passing through the engine in the scavenging strokes was insignificant in proportion to the whole.

Finally, a large number of experiments were made on the phenomena of pre-ignition. In order to cause the engine to pre-ignite, an iron bolt carrying a thermo-couple at its end was introduced into the combustion chamber. The end of this bolt was heated by the explosions, and it was found that it could be heated in this way up to a temperature of about 700 degrees centigrade without affecting in any way the working of the engine, but that if the temperature exceeded 730 degrees, ignitions would take place from the end of the bolt. The effect of these ignitions is to heat the end of the bolt up more rapidly than before; they thus tend to propagate themselves and to become more frequent, and if once they start the engine is bound to pull up. It was found that the line of division between the conditions under which safe and continuous running was possible and those under which the engine was bound to pull up was very narrow, and can be represented by an increase in the gas charge of only one per cent. This instability is due to the fact that the gas near the point of ignition of an explosive mixture is heated to a temperature much above the mean by the rise of pressure which follows its ignition. Thus the fact that ignition takes place through the bolt tends of itself to make the bolt hotter, and so to cause earlier and more frequent ignitions from the bolt.

Electro-Deposited Copper Tubes Fail Under Steam Pressures.

Recent English Board of Trade reports tend to show that seamless copper steam pipes made by an electro-deposition process have not proved the success they have been supposed to be, and the fact is now being recognized by the makers themselves that such tubes are not suitable for high steam pressures and temperatures. A recent failure of a three-inch pipe of this kind occurred on board the Lusitania, though happily unattended by personal injuries to anybody. The pipe, without warning, ripped open for a length of nine inches and allowed steam at a pressure of 195 pounds per square inch to escape full bore, although it had been in use only a year and had been hydraulically tested up to a pressure of twice its working load.

FUNDAMENTAL PRINCIPLES OF INDUSTRIAL EDUCATION.

SPECIAL MEETING OF THE AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS, UNDER THE AUSPICES OF THE EDUCATIONAL COMMITTEE, NEW YORK, APRIL 16.

A special meeting of the American Institute of Electrical Engineers was held under the auspices of the Educational Committee in the Engineering Societies Building, New York city, on Friday evening, April 16. The senior vice-president, J. G. White, called the meeting to order at 8:15 o'clock.

The paper of the evening was entitled "Fundamental Principles of Industrial Education," by Herman Schneider, dean of the College of Engineering of the University of Cincinnati.

Dr. Schneider considers that the problem of education, viewed from the point of industrial progress, is the training of the mass for efficiency in industrial and civic service. The chief end of education is so to instruct the individual that all individuals as civic units will combine to make the best possible State. There is at present a general clamor from individuals and societies representing certain industries for the introduction of training in their particular trades into the public school system. The proposition of putting equipment into the public school system to train children for all the different trades in a large city would make so top-heavy an organization and necessitate so many buildings that the imagination is staggered. The advocates of trade instruction have evaded this condition by saying that the more important trades only should be taught. Who shall decide which are the more important trades? Are the children to be taught a few of the trades, leaving all the others neglected, or will only a few be trained in the more important trades and the rest be allowed to shift for themselves as heretofore?

Since the public school system is the only organized institution capable of dealing with children in their work, and since the children are also learning a trade and earning money sufficient for their simple wants, it would seem that the only complete solution of the problem is a system of co-operation between the schools and the factories for efficiency training and civic training of young people after they have found their work.

Fortunately there are three or four experiments going on which indicate that a co-operative system is feasible in the trades as it has been shown to be in engineering training.

The fundamental principle of the co-operative system is very simple. The technique, or the practical side of the work, is taught only in a shop or store which is working under actual commercial conditions, and the science underlying the technique can be taught properly only by skilled teachers. All questions as to who shall supply the school teachers (the shop or the public), the hours the student works and the hours he is taught, the periods of alternation of shop and school work, if alternating periods be used, and the curricula of the schools—all these matters can be considered as detail for each particular case.

At Fitchburg, Mass., there is a co-operative course of five years' duration. The students are divided into two groups which alternate every week. At the end of five years the student has been taught the simple science underlying his trade. He has been taught shop mathematics and has been given a certain amount of cultural work, becoming a fair mechanic.

At the University of Cincinnati the co-operative engineering course is of six years' duration. There are six classes and there is one shop co-ordinator for each class. The shop co-ordinator is a college graduate acquainted with shop practice. He spends every morning at the university and every afternoon in the shops. His function is to make a direct weekly co-ordination of the work of the shop with the technical work of the university. All problems of shop organization, shop accounting, cost keeping, shop planning, etc., are discussed during the six years' course. In the co-operative work in the public schools there will be a shop co-ordinator for such trades as have a fairly close relationship rather than by classes as in the university.

In any department store the clerks are not usually busy until 10 o'clock in the morning. The store can easily get along with half its clerks from 8 until 10 o'clock. It is intended to divide the force into two sections, half of whom will receive instruction one week from 8 until 10 o'clock, while the other section is working. The following week the sections will be changed about. A number of rooms in the store are set aside during these two hours for class work, chairs being removed at 10 o'clock and sufficient space being reserved for any business which may be necessary up to that time.

As the paper by Dean Schneider had

been published in the April number of the Proceedings and special copies circulated to a number of people interested in industrial education by the chairman of the committee, Prof. H. H. Norris, a number of written communications were in hand and these were presented at the beginning of the general discussion.

Charles S. Howe said that the apprenticeship system was the most natural way of training industrial workers. There was an advantage in gaining experience in the shop. However, unless the superintendent has a broad view of the duty of the shop toward its apprentices, each apprentice may learn to use one machine well, spend the greater part of his time at this task, and not acquire an intimate knowledge of the other machines in the shop. Again, in smaller shops the apprentice may become familiar with only the coarser kinds of work. He thought that we are not training enough skilled workmen to meet the demands of the future in any of the trades. The trade-school method will train more journeymen than the apprenticeship method, and if conducted properly, he believes, will train them just as well as the best apprenticeship system.

V. Karapetoff considers that the principle of co-operation between schools and industrial establishments ought to be encouraged.

G. M. Basford endorsed Dean Schneider's plan of co-operative work, with the modification that the part of the development which is generally spoken of as education should in such cases be given at the works of the company.

Ralph W. Pope considers that there can be no question as to the benefit to the individual of an industrial education; even though the person learning the trade may never be required to practice it for earning a livelihood, knowledge of a handicraft, especially if he has a natural taste for the particular branch which he has studied and practiced, will be a source of satisfaction to him. In a comparatively new country the demand for labor of all grades can only be met by immigration. High wages will not divert the rising generation from their tendency to obtain a livelihood in some way other than working at the bench. Unless some method can be devised to counteract this tendency the final outcome of industrial education so far as furnishing a supply of skilled apprentices is concerned will simply add to the already overburdened curricula of our public schools.

A contribution was presented by Sydney W. Ashe, detailing a course of instruction which has been prepared for employes of an operating company.

A. D. Dean, chief of the Division of Trade Schools of the State of New York, said that there is a lot of interest being taken in industrial education. Education is largely, or entirely, a public function, and he was glad to see Dean Schneider emphasize this point. Private institutions can always train their workmen, but it must be primarily the duty of the State to educate its children. While there are many friends of the new idea of education, there are almost as many opponents; in fact, in large industrial communities there is strong opposition to the trade-school idea.

C. R. Dooley, president of the Casino Technical Night School of Pittsburg, Pa., said that as a rule students do not comprehend that education means ability to do as well as to know. Students are the only class of people who have this one-sided view. The college graduate, however, is regarded by his employer as little more than good raw material. He is first put through a special course in order to undo a great deal that the college has just finished doing by way of changing his point of view. The economic advantages of the co-operative plan are marked. The trade school is necessarily inadequate and unjust to its students, or it is extremely expensive and therefore uneconomical.

C. E. Downton, assistant superintendent of the Westinghouse Electric and Manufacturing Company, in charge of apprentices, said that the company had made several attempts to evolve comprehensive apprenticeships for trade apprentices. The public schools do not meet the requirements of the trades, neither can they be expected to. The problem is entirely beyond the scope of any public-school system. The manufacturers must come to the rescue and assist the school system by taking up the educational career through the co-operative system; or the manufacturers themselves should be willing and anxious to organize and put in force an educational system in connection with the shop apprenticeship course adequate to the mental development required for each particular trade associated with the product manufactured by them.

The paper was also discussed by Prof. W. S. Franklin, John Price Jackson, Charles F. Scott, Dr. Steinmetz, H. L. Gantt, Prof. D. C. Jackson and O. A. Kenyon.

Court Admits Ignorance About Electricity.

The Court of Civil Appeals of Texas says, speaking through Justice Hodges, in Southern Telegraph and Telephone Company vs. Evans, 116 Southwestern Reporter, 418, that the courts are probably required to take judicial knowledge of natural laws which govern the causation of physical phenomena, such as electric activity, and in that respect expert testimony may be regarded as intended more for the judicial enlightenment of the court than the establishment of probative facts. However, the writer deems it pertinent to say that, whatever may be the scientific attainments of other tribunals regarding the nature and character of electricity, this court has not yet acquired sufficient enlightenment from any source to cause it to cease to regard with wonder and amazement, and with a sense of abject helplessness, the marvelous movements and perilous pranks of that mysterious agency or force. Nor does the court consider it a reflection on the learning of those who testified as experts in this case to say that they furnished but little illumination except to explain the intricacies of telephonic instrumentalities as used today.

Proposed Uniform Rating for Internal-Combustion Engines.

The Internal Combustion Engineers' Association, Chicago, is seeking, by means of a circular question letter, to obtain the opinions and experiences of gas and gasoline-engine manufacturers on the subject of a uniform rating for internal-combustion engines.

The subject is a very pertinent one, and the timely action of the association is greatly to be commended. It is to be hoped that all interested in the internal-combustion engine will get together on this question and establish some practical and universal ruling on the points at issue.

The great variations in the fuels used in the internal-combustion engine, the influence of atmospheric conditions on the fuel itself and on the quality and composition of the explosive mixture, and the question of fuel economy for specified loads, make a rigid standardization very difficult, and it is impossible to answer offhand the proposed questions of the association. A joint debate of representative interested parties should prove of great value toward a final solution of the problem.

The Faraday Society.

The forty-third ordinary meeting of the Faraday Society was held on Tuesday, March 30, at the Institution of Electrical Engineers, London. Dr. H. Borns occupied the chair. The following nominations for the officers and Council (1909-10) to be elected at the annual general meeting were announced:

President—J. Swinburne.

Vice-Presidents—G. T. Beilby, Sir R. A. Hadfield, Prof. A. K. Huntington, Dr. Ludwig Mond, Lord Rayleigh, Prof. A. Schuster and Ernest Solvay.

Treasurer—Dr. F. Mollwo Perkin.

Council—E. J. Bevan, Bertram Blount, A. C. Claudet, W. R. Cooper, S. Z. de Ferranti, F. W. Harbord, W. Murray Morrison, H. F. K. Picard, J. L. F. Vogel and N. T. M. Wilsmore.

A paper by E. Sabersky and E. Adler, on "A New Electrical Hardening Furnace," was read by Mr. Adler. The authors described a new hardening furnace built by the Allgemeine Elektricitäts-Gesellschaft, Berlin, and consisting of a fireclay crucible containing a bath of metallic salts. By means of the electric current these salts are melted and kept at a temperature which can be made to reach any value up to, say, 1,400° C. For working this furnace, alternating current of a voltage not exceeding seventy is used, and by means of a transformer fitted with regulator and switchboard, the supply voltage is lowered to this value. The authors also explicitly described the method of operating the furnace and of measuring its temperature.

They also further set forth the general principles underlying the hardening process. They showed that hardening means, essentially, the fixation of the "martensitic" state of the steel. The hardening process consists of:

(*a*) Heating up of the steel to a temperature above the transition line.

(*b*) A subsequent rapid cooling down.

The authors gave a list of propositions covering the features an ideal furnace should possess, and tried to show that the new furnace fulfills these conditions to a greater extent than any furnace on the market. They also claim that the operating cost of the new furnace on the basis of equal output works out lower than that of gas-fired muffle or bath furnaces.

F. W. Harbord described some of his experiences with the furnace in heating a large number of steel bars from 800° C. to 1,230° C. and keeping them at a high and fairly constant temperature for some time; this was done without difficulty.

W. Rosenhain thought the furnace had decided advantages for the hardening and tempering of tool steels. Too rapid heating of a piece of metal of uneven cross-section might be undesirable, as expansion stresses would be set up. The uniformity of temperature attained was probably largely due to lagging. He hoped that use of the furnace would throw light on such questions as whether heating to what are excessive temperatures when the metal is exposed to furnace atmospheres is also injurious when the metal is submerged in fused salts.

T. Vaughan Hughes considered that the electric furnace had many drawbacks compared with producer-gas-fired equipments, such as too sudden heating, the trouble in dealing with fused salts, and the difficulties of handling large quantities of goods. He was of opinion, too, that its efficiency was low compared with existing furnaces, especially for maintaining comparatively low temperatures.

Dr. C. H. Desch considered that the furnace did away with the old difficulty of judging hardening by means of skill acquired with the eyee. A pyrometer was of no use in an ordinary muffle.

Mr. Adler replied to the various points raised. The rate of heating depended on the voltage, and was under control. No action of the fused salts on steel had been observed. Mr. Hughes admitted the scientific value of the furnace, but appeared to consider that scientific accuracy was unnecessary for scientific work. Of course, much larger furnaces than those now made could be built, and their efficiencies would increase accordingly. Optical pyrometers might perhaps be used above 1,400° C.; for ordinary purposes thermo-couples were preferable. There was no difficulty in starting the furnace, which took some fifteen to twenty minutes.

A paper entitled, "The Relation Between Composition and Conductivity in Solutions of Metal-and Ortho-Phosphoric Acids," by Dr. E. B. R. Prideaux, was read in abstract by Dr. T. M. Lowry. The results of simultaneous determinations of amounts of HPO_3 and H_3PO_4 and of electrical conductivity show that the conductivity of the changing solution decreases at first slowly, then more rapidly, and then more slowly again.

Dr. F. M. Perkin read a paper on "The Electro-Analysis of Mercury Compounds with a Gold Cathode." The results obtained were always slightly high—from 0.5 to one per cent. This was at first attributed to occluded hydrogen; but it was not found that the gold electrode increased in weight when made the cathode in dilute sulphuric acid, and the current passed for six to twenty hours. When the electrode coated with mercury was treated in a similar manner it also showed no increase in weight. The increase in weight could hardly be due to oxidation, since the electrode was cathode, and when a platinum electrode was run in series with it the mercury deposited upon the platinum was always slightly less than was theoretically required. The author was consequently unable to account for the results, but pointed out that a gold electrode could not be satisfactorily used for analytical purposes.

A rotating silver electrode showed similar results—viz., the weight of mercury was too high. Usually the time required to deposit the mercury was from five to six hours, but by placing the cell and electrodes in a powerful magnetic field in such a way that the liquid was caused to swirl, the mercury was deposited in about fifty minutes. The results in this case, however, were also too high. The author also described two new quartz vessels which he had devised for depositing mercury or other metals upon a mercury cathode, one of them being fitted with a siphon side tube. In conclusion, the author said that undoubtedly the best electrode for depositing mercury upon was one of mercury, and that the deposition was extremely rapid if a rotating anode was employed.

Radium Institute for Heidelberg.

The *Scientific American* is authority for the statement that a radium institute of the kind already in process of formation in Vienna, London and Berlin is to be opened for work in Heidelberg in the present year. An endowment has been secured and the Heidelberg Institute will thus be the first of its kind actually to come into existence and to commence work. It is to be known as the Radiologische Institut. The new institute is to be under the same direction as the Physikalische Institut of the University, and will thus secure full benefit from the whole existing resources of the university. The endowment will insure the furnishing of the institute with the best equipment that can be secured, while the spring sediments from the neighboring state of Kreuznach, to be worked up by the government salt department, will provide a source of radio-active material for clinical and scientific investigation.

ALTERNATING CURRENTS AND THEIR APPLICATIONS.

BY EDSON R. WOLCOTT.

CHAPTER VIII. (PART II) — POWER TRANSMISSION.

INSULATORS.

The resistance of insulators can be considered as of two kinds—that opposing the passage of electricity directly through the insulating medium and that opposing the passage of electricity over the surface of the medium. The latter depends chiefly on the capacity of the medium to withstand exposure, that is, to retain its chemical composition and a smooth, dry surface, so as not to collect moisture or dust. Glass and porcelain are the materials used commercially for insulating high-tension lines, and only the latter where the pressure exceeds 15,000 volts.

In all cases the surface of the insulators of transmission lines is made as great as possible, as shown in Fig. 151. By the use of several overhanging shells, technically known as "petticoats," not only is the total surface increased, but the shells act as a protection for each

FIG. 151.—VITRIFIED PORCELAIN HIGH-TENSION INSULATOR.

other against rainfall and tend to prevent the accumulation of moisture over the entire surface.

To be sure, the nature of the surface is of the utmost importance and great care is necessary in glazing the porcelain so as to make it non-hygroscopic and to leave it smooth so that dust or moisture will not be retained.

For very high tension the wooden arms and poles of a transmission line can scarcely be considered as insulators, so that about the only real insulating space between the conductor and the ground is that between the wire on the top and the pin within the inner shell of the insulator. If the entire surface becomes wet the moisture will act as a conductor, but usually the volume of current flowing over it would then be sufficient to vaporize the thin film at some point and thus interrupt the flow.

The pin type of insulator, such as that shown in Figs. 151 and 152, has been

FIG. 152.—PORCELAIN INSULATOR MOUNTED ON IRON PIN.

found quite satisfactory for the high-tension lines built up to about a year ago, in which the potential was practically limited to about 66,000 volts. For voltages much above this, however, the pin-type of construction has certain disadvantages resulting from the following considerations: Since the striking distance increases rapidly with increased voltage, it is necessary to increase the dimensions of the insulator and therefore its weight to such an extent that the load upon the pin becomes excessive, particularly on account of its increased length, giving the pin a weakening leverage; the cost of the insulators for very high voltages likewise becomes excessive, while at the same time they are none too strong mechanically and electrically.

A new form called the suspension insulator has been developed within the past year that is particularly adapted for extremely high voltage lines. As shown in Fig. 153, several porcelain insulating discs are suspended, one from another, after the manner of a Japanese gong. The line, instead of being supported on top of the insulator, is suspended from the lowest disc unit. The links between the two units are embedded in a manner similar to that shown in Fig. 154, which is a unit in a strain insulator used in guying the line.

The use of suspension insulators has permitted the successful operation of transmission lines using a line potential of 110,000, or even 120,000 volts. Four or five insulator units constitute a set for this potential. By adding units still higher potentials are available. The advantages of this form of insulator are: Adaptability; decreased danger of breakage in transportation; simplicity of line construction, especially on turns; breaking of a unit does not destroy the entire insulator; better protection from lightning, since the line conductor is below the cross-arm; gives the greatest mechanical strength, with the least weight for any given electrical and mechanical factor of safety.

SILENT DISCHARGE.

An insulator under heavy electric stress may show a silent discharge of electricity through the air, the so-called brush discharge, which is faintly luminous, diffused and not disruptive. The appearance of this phenomenon is an in-

FIG. 153.—SUSPENSION-TYPE INSULATOR.

dication that, while the insulator has remained intact, the insulating power of the air has been partly broken down; that is, the air has become ionized. The electricity may thus escape from the line through the ionized air to the earth or to another conductor. The occurrence of this type of discharge depends very largely upon atmospherical conditions; the ionization of the atmosphere is a varying quantity, depending on many things. The transmission line should, of course, be built to stand normal conditions for a given locality, with suitable protection for unusual occurrences. The brush discharge does no harm to the insulation; only when the charge has accumulated to

such an extent that the insulation is punctured and of no further value, is damage done.

PROTECTIVE APPARATUS FOR TRANSMISSION LINES.

The high-tension charges that appear on transmission lines are usually of an oscillatory nature and in most cases of extremely high frequency. As the frequency increases the inductive effect of a coil also increases, so that a coil of wire which offers but little more opposition to an ordinary sixty-cycle alternating current than to a direct current may present a practically prohibitive opposition to a very high-frequency discharge.

It will be remembered that the expression for the impedance or total opposition to the flow of an alternating current in a circuit having resistance and inductance is expressed as follows:

$$Z = \sqrt{R^2 + (2\pi fL)^2}$$

Suppose that f should have a value of several hundred thousand; even though

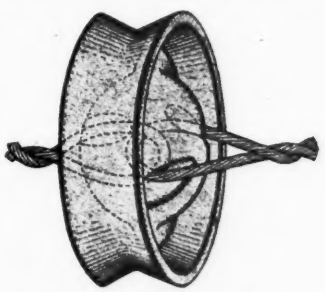


FIG. 154.—METHOD OF INTERLINKING STRAIN AND SUSPENSION INSULATORS.

R and L be very small, Z, under such conditions, may have a very large value.

The value of the inductance L of a transmission system whose wires are straight is very small, but not zero. The change in the value of the current produces a change in the surrounding magnetic field which reacts on the wire to

RESISTANCE AND REACTANCE OF ONE MILE OF STRAIGHT WIRE OR ONE-HALF MILE OF SINGLE-PHASE LINE (EMMET.)

Size of Wire. B. & S. Gauge.	Resistance in Ohms.	Reactance in Ohms.					
		60 Cycles.			125 Cycles.		
		Distance Between Wires.			Distance Between Wires.		
		12 In.	18 In.	24 In.	12 In	18 In.	24 In.
0000.....	.259	.508	.557	.591	1.06	1.17	1.23
000.....	.324	.523	.573	.607	1.09	1.20	1.26
00	.412	.534	.588	.618	1.12	1 23	1.29
0.....	.519	.550	.603	.633	1.15	1.26	1.32
1.....	.655	.565	.614	.648	1.18	1.28	1.35
2.....	.826	.580	.629	.663	1.21	1.31	1.38
3.....	1.041	.591	.644	.674	1.24	1.34	1.41
4	1.313	.606	.656	.690	1.26	1.37	1.44
5.....	1.656	.620	.670	.704	1.30	1.40	1.47

generate a current in the opposite direction. This is self-induction and resembles inertia in many ways, as already explained. The result of coiling the wire is simply to increase the effect.

The actual value of the inductances of straight wires is shown in the accompanying table, from which it will be seen that even with ordinary frequencies the reactance is of about the same order as the resistance. With the high frequency of the high-tension charges induced by lightning the reactance becomes so large that the discharge frequently bridges an air-gap or breaks an insulator and rushes to ground. This principle is made use of to a considerable extent in the construction of lightning arresters.

When a grounded conductor is brought near the transmission line, so that their terminals are but a few inches apart, the oscillatory high-tension discharge finds the impedance of the air-gap less than that of the line and jumps across the gap to ground. It is, of course, necessary that the arc formed by the discharge through such a lighting arrester be only momentary. Otherwise the main current might be deflected, because of the reduced resistance of the gap after the arc has formed.

The Chicago Electric Club.

The weekly midday lunch of the Chicago Electric Club was held on Wednesday, April 14, in the grill room of the Chicago Automobile Club. The speaker was A. G. Shaver, signal engineer of the Chicago, Rock Island & Pacific Railway, the topic being railway-signal practice. Mr. Shaver gave a brief description of the elements entering into the signal interlocking system of the modern steam railway. He discussed the signaling system which is in operation in connection with the eighteen-hour flyer leaving Chicago over the New York Central Lines. He called attention to the large expenditures which were necessary in carrying out the present-day automatic and manual block signaling systems, and stated that the Rock Island system would expend something like $300,000 during the coming season in adding to and improving its signaling system.

With regard to the use of the telephone in train dispatching, Mr. Shaver said that where this had been introduced it had met with considerable favor and that he believed it would be possible, through the intermediary of the telephone, to greatly facilitate the handling of traffic at the more congested points. A large number of railroads have introduced telephone dispatching on sections of their lines and are extending its use.

A Novel Hydroelectric Installation for a Country Residence.

About fifty miles east of Sacramento, Cal., Ellis Franklin has successfully harnessed a little trout stream to do most of the mechanical work about his farm, the heating and lighting of the buildings, and the cooking, washing, ironing, and numerous other small chores about the premises. Mr. Franklin has utilized an old miner's ditch, which he repaired and converted into a reservoir of 100,000 cubic feet capacity, to store up a supply of water against the dry months when the flow of his stream is very small.

A six-inch riveted steel pipe, 445 feet in length, carries the water to the foot of the fall, where the power house is located. The little two-foot waterwheel in the power house works under a seventy-five-foot head and is belted to a 240-volt, six-horsepower General Electric generator. The water enters the waterwheel through a one-and-one-half-inch nozzle and develops more than six horsepower.

Current from the power house is carried to the house, a quarter of a mile away, over a small copper wire strung on twenty-foot poles.

In the basement of the house a three-horsepower motor operates a centrifugal pump, and with line shafting drives a washing machine, wringer, churn, cream separator, grindstone and a circular saw.

Near the switchboard in the house is a small crank attached to a shaft running through the wall to the outside. By a system of pulleys this crank operates two long galvanized iron wires, running just beneath the transmission wire, which open or close the waterwheel gates as desired. An electric buzzer on the switchboard tells when the gate-valve is tightly closed.

The residence is beautifully lighted. Lamps aggregating fully 900 candlepower make the rooms as cheerful and pretty as any city home.

Every night in the year the plant carries an average of thirty to forty lights from dusk till midnight, and after that time a lesser number. With the other services it performs during the day time the amount of electrical energy used on this farm, if valued at the rate of ten cents per kilowatt-hour, would be worth more than $700 per year. When we consider the fact that the plant did not cost more than $1,500, which includes costly fixtures, the waterworks system and all appurtenances, we find that it is paying a handsome profit on the investment.

The Forthcoming Electrical Show at Omaha.

The second annual electrical exposition at Omaha, Neb., is announced to take place May 6 to 15 next, at the Omaha Auditorium. Hundreds of local electrical interests will be represented, besides many of the firms of national reputation, and a good opportunity is thus offered for those interested to get in touch with the electrical trade. Besides the usual electrical exhibits and demonstrations, an elaborate programme of music and vaudeville will be put on each evening and the utmost efforts of the promoters will be put forth both to instruct and entertain their patrons and visitors.

All booth space will be enclosed with substantial posts and railing, and supplied with sufficient light for ordinary purposes without expense to exhibitors. Exhibitors will be required to pay a reasonable charge for extra light and for power.

Booths numbered 1 to 16, extending along the sides of the building, contain 180 square feet of floor space, and will be leased at fifty cents per square foot, or $90 per booth. There are sixteen corner booths in the four arena sections, which are ten by twelve feet, containing 120 square feet of floor space each. These will be leased at seventy-five cents per foot, or $90 per booth. All other booths in the four arena sections contain 120 square feet of floor space, and will be leased at sixty cents per square foot, or $72 per booth.

The Nebraska Electric Light Association will hold a meeting in Omaha during this exposition, and a large attendance of prominent men is expected.

Uniform and Convenient Mathematical Notation for Printing.

The council of the Royal Society of London has for some time been considering the use of a universal system of printing for mathematical symbols and formulæ which should be easily printed and moreover look well on the printed page. The matter has especially been the subject of attention of Lord Rayleigh and Professor Larmor.

The use of the solidus, or slanting line, has been recommended for a large number of examples, and the substitution of the parenthesis for the vinculum, especially in the case of quantities under the square root sign, is also to be preferred in many cases. Smaller type for fractional indices and coefficients, and the use of negative exponents, often prevent an unsatisfactory appearance of the printed page.

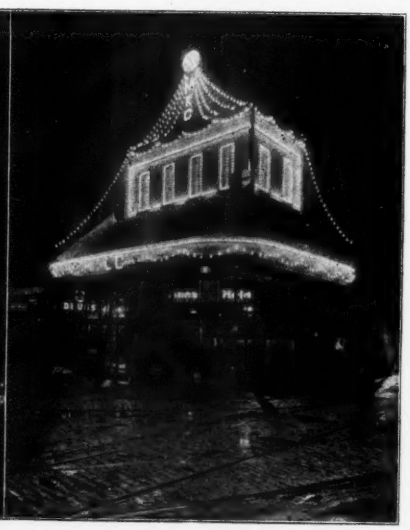
In the preface to his "Mathematical and Physical Paper," Vol. I, 1880, the late Sir George Stokes successfully introduced the limited use of the solidus notation, obtaining the assent and support of Lord Kelvin, Prof. Clerk Maxwell, Lord Rayleigh, the editors of the *Annalen der Physik,* and many other mathematicians. He defined its use as restricted to the symbols immediately on the two sides of it, unless a brace or stop intervenes; thus sin $n\pi x/a$ is to mean sin $(n\pi x/a)$; but if sin$n\theta/rn$ had been used, it would mean (sin $n\theta$)$/rn$.

Decorative Street Lighting at New Orleans.

Ever since we can remember, way back into the Creole days, New Orleans, La., has been a city of carnivals. There was a time when flambeaux and torches, gay buntings, confetti, and striking costumes were depended upon to produce spectacular effects. Nowadays, the celebration of the Mardi Gras carnivals and similar occasions calls for the more conventional conceptions of decoration and costuming, and multicolored incandescent lamps arranged in myriad forms are utilized to produce the most remarkable representations. The accompanying illustrations give

SIGN ON CANAL STREET, MARDI GRAS, NEW ORLEANS, LA., FEBRUARY 23, 1909.

THE BOSTON CLUB.



THE LOUISIANA CLUB.

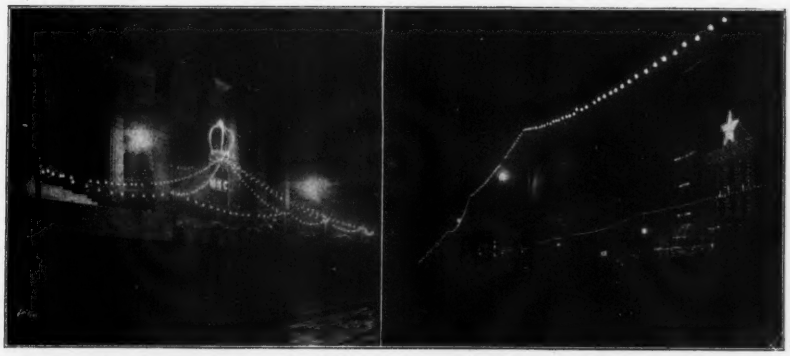
a small idea of the electrical illumination of the principal points of interest in the city of New Orleans during the visit of President Taft on his return from Panama. These illuminations were repeated during Mardi Gras week, which followed soon thereafter, and all this time the city was in a blaze of light. The community was so greatly pleased with the visit of Mr. Taft that it took every opportunity to show its admiration, and Canal Street, the main thoroughfare, and all the cross streets, were ablaze with streamers of electric lamps, producing a magnificent illumination.

The most prominent sign which took part in the dual celebration of Mr. Taft's welcome and the Mardi Gras was the large letter decoration suspended across Canal Street, with the legend, "Welcome to the Winter Capital of America." This sign was furnished free through the co-operation of the New Orleans Railway and Light Company and the Federal Sign System Electric, the latter company being responsible for most of the sign decoration.

The New Orleans Railway and Light Company has one of the largest plants in the city, and its power houses are so connected as to offer the greatest factor of safety to all its consumers. The company operates fifty-three miles of single track, sixty-six miles of double track, and eleven miles of special sidings occupying 119 miles of right-of-way. It has three power stations, with twenty-one engines for the generation of power. During last year $78,000 was expended for power-station improvements, the largest portion of this being used for finishing up the construction of the central power plant. A 5,000-kilowatt turbine has been contracted for, and it is the intention to install this at the central power station with a complete condensing apparatus and steam and water piping, to be ready for service during the heavy-load period of the coming fall.

CANAL STREET, MARDI GRAS, NEW ORLEANS, LA.

THE PICKWICK CLUB. COURT OF HONOR ARCH. THE BEAVERS CLUB.



THE CITY HALL, MARDI GRAS, NEW ORLEANS, FEBRUARY 23, 1909.

CANAL STREET, MARDI GRAS, NEW ORLEANS, FEBRUARY 23, 1909.

The operating revenues of all the properties for the year ended December 31, 1908, were $5,968,498. The operating expenses of all the companies in the system were $3,364,984. There was added to the surplus during the year $498,953. Five companies are merged in the system.

The officers are Hugh McCloskey, president; Elwin C. Foster, vice-president; Joseph H. DeGrange, vice-president; H. A. Ferrandou, treasurer and auditor.

Electrolytic Precipitation.

Mark R. Lamb, in a recent article in the *Engineering and Mining Journal*, urges a judicious combination of electrolytic and zinc precipitation in recovering metals from cyanide solutions. Mr. Lamb instanced a plant in which the zinc consumption would be reduced from 270 pounds to forty pounds a day by employing an electrolytic plant, with only a very slight charge for power.

UNWITTING PHILANTHROPISTS.[1]

BY GLENN MARSTON.

Public-utility corporations are, from the very nature of the service they render, in a position to benefit a community far more than any other business of which a town or city may boast. The good they do reaches far beyond the donations to charity and other worthy movements which constitute the outward and visible signs of public beneficence. They accomplish a far greater good than this, and the effect of this good is not diminished by the fact that it is, as a usual thing, unrecognized.

In this day of attack on corporations of all kinds, we are not in the habit of considering the fact that some of these corporations may, in the simple performance of their business routine, be the greatest philanthropists of the day. Their benefactions are not heralded, Carnegie-like, through the public press; and yet every public-service corporation, even though it may have only an eye single to increasing its income, performs a duty to society, which, though overshadowed by the vilification of disgruntled agitators, is deserving of far more recognition than it gets.

The public-service corporation has solved the problem of combining business and philanthropy. This is particularly true of those dispensing electrical energy. What other single influence has had as great an effect on general industrial and social conditions in the last decade as electricity? What influence has gone so far toward abolishing child labor, toward driving out sweat-shops, toward advancing the cause of the laboring man, toward the improvement of health conditions and toward the prevention of crime? Workers for progress in any one of these lines have received unlimited praise, and justly, too. Why, then, should not the corporation receive its share of praise for the benefits conferred upon society by it? Is it because of a difference in motive? Does no good result from efforts for the improvement of society unless those efforts are wholly unselfish? Why should the desire to make money out of philanthropy make that philanthropy any less praiseworthy? In my opinion, the individual or the corporation who can bring reform to the most satisfactory commercial basis has done more for society than all of the contributors to charity in the world. We may grant that the public-service corporation is not a philanthropist from any high moral purpose. We must recognize that its efforts are due, primarily, to a desire to increase its profits, but whatever the incentive for social reform may be, it has little effect on the tangible results produced.

For example, you cannot get at the employer of child labor through appealing to his moral sense. The very fact that he is an employer of children is practical proof that he has no moral sense. The only way to get at him is through his pocketbook, and this is what the electric-power man has done. When you convince an employer of child labor that child labor is more expensive than mechanical labor, societies for the extinction of this form of inhumanity will become unnecessary.

In the same way the public-service corporation has taken greater steps toward driving out sweat-shops than any other influence. The sweat-shop evil cannot thrive in competition with sewing machines which operate at from five to ten times the speed of a foot-power machine; and yet practically the same grade of labor—the same intelligence—is required to operate a power-driven machine as is required to operate a foot-power machine. You have here in a nutshell one of the greatest social reforms of the day.

Over at the Natural History Museum they have a tuberculosis exhibit. I have not yet had an opportunity to visit it, but if the electric-light and power companies are not largely represented as leading factors in the fight against tuberculosis, they should be. They have driven the child from the factory to the open air; they have driven the alien laborer from the sweat-shop to the loft. Where the air in a crowded room has formerly been exhausted by exposed illuminants, today every particle of oxygen is free for the use of the occupants of that room, because electric light consumes no oxygen. Pure air is the greatest foe to tuberculosis, and those who provide electricity for industrial purposes must be given their place among the philanthropists who have contributed to this great cause. I do not say that they are generous philanthropists, for generosity suggests self-sacrifice. It is not self-sacrifice of the public-service corporations to effect all this good. They are doing it because it is profitable to them; they have made a business of philanthropy. In making money for themselves they are improving the industrial conditions of others—they make it possible for others to make more money—and usually when a man increases his income he advances his social position. He is enabled to live better, and in living better his moral standard must be raised.

This is all being accomplished on a strictly business basis, the basis on which all permanent advancement, commercial, social and moral, must be made.

But it is not alone within the factory or within the sweat-shop that the electric companies have done good. For years and years, boards of health all over the country have energetically and ineffectually tried to abolish the smoke nuisance. Rules and rules have been promulgated, factory owners have been fined, every possible action has been taken—and the chimney smokes on. Then along comes the electric company and shows the manufacturer that electricity is cheaper, cleaner, more economical and more convenient than steam power. The fires go out and another step has been taken toward abolishing the smoke nuisance, a step more advantageous than all of the ordinances and board-of-health rulings in the country. The offender's pocketbook has been touched, and the community is benefited directly by the aggressiveness and business ability of the managers of the electric company.

But perhaps the greatest influence for good which an electric company exerts in a community is in the prevention of crime. This is accomplished through securing adequate street lighting. The electric company does not stop, however, when it has induced the city to place an electric light at every street intersection. Then it goes to the merchant and once more appeals to his pocket. The electric man says, in effect: "Here is an electric sign which will cost you so much a month to run. By having this sign in front of your store, you will attract attention to your store. People who want to buy like to see what you have, and if they see what they want, they will get it. If you do not have the sign, many will pass your store by and not give it a second thought. An electric sign will pay you from a business standpoint."

But these arguments leave out of consideration, the benefits that such a sign confers upon the public at large. It is only necessary to go downtown any night to find that the popular streets are the well-lighted streets, and this is due to two reasons: One is that light is quite as attractive to a human being as it is to an insect; people always flock to the centre of light. The most brilliantly lighted window on the street is the most attractive

[1] A condensation of an address before the departments of Economics and Sociology, Adelphi College, Brooklyn, N. Y., January 11.

one; the theatre with the brightest front is the one best patronized. On the other hand, the people flock to a well-lighted street because it is a safe street. You do not hear of hold-ups under the glare of the electric light. The highwayman seeks the dark corners. Every merchant who puts up an electric sign throws light in a corner which might have harbored a robber. Every merchant who lights his window brilliantly makes it impossible for a burglar to use those windows as an entrance to his property.

I have had statements from mayors of some of the largest cities in this country testifying to the advantages of adequate street lighting. One went so far as to say that if all of the electric signs—not to mention the city street lighting—were taken away, it would be necessary practically to double the police force. Consider, then, the yearly saving to the taxpayer, for street lighting alone, due to the lighting company's aggressiveness in securing the installation of electric signs.

The churches have just begun to realize the influence which can be exerted by an electric sign. Some of them have illuminated crosses above their towers. Others have "Welcome" signs over their doors—an insistent demand to the passerby that he enter. The church can use the electric sign just as effectively as the brewer—but the church has got to find that out.

It would be a difficult matter to estimate the increase in taxable value that has been caused by the introduction of electricity. The house which is wired for electric light demands a higher rent than one not so equipped. It is more easily rented. Its whole value, therefore, is increased. The same thing is true of factory and loft buildings equipped with electric motive power. Such equipment must be recognized as a distinct financial advantage.

I might go on and show you a dozen more ways or perhaps a hundred more ways in which the application of electricity has contributed toward the advancement of a city. It has been said many times that public-service companies give no adequate return for the franchises given them by the public. It has been said many times that cash payment should be made for these franchises, and yet, I venture to say, that the actual benefits to a community derived from the introduction of electricity alone are so great that the greatest profits from the most exorbitant corporation in the country would sink into insignificance beside them.

Sir William Ramsay on Transformation of the Elements.

In the course of his presidential address before the Chemical Society, London, on March 25, Sir William Ramsay said, as reported in the London *Times*, that his subject was the hypothesis that the genuine difference between elements was due to their gain or loss of electrons. The question was whether, to take a concrete example, an atom of sodium by losing or gaining electrons remained an atom of sodium, or whether the loss or gain of electrons did not cause it to change into some other element or elements. Having stated some theoretical arguments in favor of the possibility of transformation, he went on to describe some experiments bearing on the question. He first mentioned the transformation of radium emanation into helium, which had been amply established. He next referred to his experiments on the action of emanation on solution of copper sulphate and nitrate. Four experiments were made, and with each exactly similar duplicate experiments were tried in which no emanation was employed. A larger residue was obtained in each case from the emanation solutions than from the duplicates, and while the residues from the emanation solutions showed a faint trace of lithium, those from the duplicates failed to give spectroscopic evidence of the presence of that element. The fact of the experiments having been carried out in duplicate rendered inapplicable the criticism of Professor Hartley that accidental contamination with lithium was probable. As regards the alleged repetition of the experiments by Mme. Curie and Mlle. Gleditsch, who, using platinum vessels, obtained no greater residue and no trace of lithium, there were two possible replies—either the conditions were varied, or conceivably a trace of lithium from the glass vessel employed (which, however, had been tested for lithium with negative result) was dissolved in presence of emanation and copper but escaped solution in absence of copper or of emanation. A research on the action of emanation on solution of silver nitrate contained in a silica bulb yielded negative results, but he had stumbled across a case of apparent transformation while working in a totally different direction. On December 20, 1905, 270 grams of purified thorium nitrate were dissolved in about 300 c.c. of water, and the flask in which the solution was contained was repeatedly evacuated by a mercury pump until no gas could be pumped off. The stopcock attached to it was then closed, arrangements being made so that if any leakage occurred it would be detected. After the flask had stood for 168 days the gas in it (5.750 c.c.) was pumped out and examined for helium with doubtful results. The flask was again closed, and on August 3, 1907, after 173 days, the gas in it was again examined. Again the presence of helium was questionable, but 1.08 c.c. of carbon dioxide was found. At the next examination, on March 30, 1908, there was distinct evidence of a helium spectrum, and the gas contained 1.209 c.c. of carbon dioxide. It was then thought possible that the carbon dioxide had been produced from the grease of the stopcock, and therefore a little mercury was introduced into the capillary tube leading to the stopcock so that the latter was protected from contact with the thorium solution. After 310 days the gas was again withdrawn. Instead of three c.c. or four c.c. no less than 180 c.c. were collected; it was almost pure nitrogen, but in all 0.622 c.c. of carbon dioxide was separated from it. These experiments, Sir William Ramsay said, rendered it at least probable that thorium engendered carbon dioxide, or, in other words, that carbon was one of its degradation products. Experiments further indicated that the action of radium emanation on thorium nitrate solutions was also attended with the formation of carbon dioxide, and the same was the case with an acid solution of zirconium nitrate. An experiment with lead chlorate proved blank, but with bismuth perchlorate the formation of carbon dioxide appeared certain. In conclusion Sir William Ramsay, after mentioning that every precaution which could be thought of was taken to exclude foreign gas, said that while these were the facts, no one was better aware than he how insufficient was the proof, and that many other experiments must be made before it could be confidently asserted that certain elements, when exposed to "concentrated energy," underwent degradation into carbon.—*Science.*

Interpretation of the New British Patents Law.

In a recent case under the new patent law before the British Appeal Court, Mr. Justice Parker handed down the opinion that not even fifty per cent of the article need be manufactured in the British Isles to justify the patentee. The patented article must be manufactured to as great an extent as can reasonably be expected, having regard to the industrial development of other countries.

Development of the Twin City System.

Edward H. Scofield, mechanical and electrical engineer of the Twin City Rapid Transit Company, lectured before the senior electrical engineering students of the University of Minnesota on April 7, 1909, upon "The Development of the Power System of the Twin City Rapid Transit Company." Beginning with the days when cars were drawn literally by horsepower, Mr. Scofield outlined the various steps in the development of the power houses to meet the ever-increasing demands for power. In the early days of the system small electrical generators were driven by triple-expansion Corliss engines through long lines of shafting, the 150-horsepower generator being the largest obtainable at that early day. Triple-expansion engines were used because of the high economy of steam obtained by them in running under favorable conditions. The violent fluctuations in the load which characterized electric railways were found to make such high efficiencies unattainable and they also were found to be destructive to the engine, involving heavy repair and maintenance expenses. These engines were succeeded by compound vertical Corliss engines. The latest additions to the steam plant have been steam turbo-generators.

The economy of waterpower was early recognized and the "lower dam" was built half a mile below St. Anthony Falls, where the maximum of 10,000 horsepower became available. As one result of the control of the Mississippi River by the government reservoirs the flow has been more uniform, so that it has been possible to develop more power at St. Anthony Falls. There is now available at this new plant 12,000 horsepower during times of normal water and on Sundays when many of the mills are closed. The establishment of the main steam plant close to the river and adjacent to the railroads, together with the installation of modern coal-handling and stoking apparatus, has rendered possible the substitution of slack coal for the more expensive grades formerly used. Fortunately there is plenty of water during the months when slack coal is scarce.

For the last ten years the demands for power have increased at the nearly constant rate of twenty per cent annually. The extension of the system, including suburban lines, has required the adoption of alternating current for transmission and distribution to the numerous substations where the power is changed to 600-volt direct current for the trolley circuit. Detailed descriptions of the equipment of the power stations and substations were given in the Transactions of the American Institute of Electrical Engineers for 1907.

Great Waterpower Development in Georgia.

A total amount of $36,000,000 will be spent in waterpower development in Georgia within the next few months, according to the officials of the Central Georgia Power Company, of Macon, Ga. There is plenty of money to carry the movement to a rapid, successful completion. Interested in the Central Georgia Power Company are some of the strongest financial interests in the United States and Canada. Among the number may be mentioned A. B. Leach and Company, of New York; J. E. Aldred, of Montreal; H. S. Holt, of Montreal; F. B. Scheck, of New York; J. I. Buchanan, of Pittsburg, and a score of other wealthy men of New York, Boston, Pittsburg, Chicago, Montreal and other cities.

That Georgia is soon destined to have the greatest waterpower development of any of the Southern States is shown by the fact that, in addition to the large dam being built across the Ocmulgee River, eight miles from Jackson, Ga., which will, when completed, generate 20,000 horsepower, immense dams will be built on the Flint and Oconee rivers. The Central Georgia Power Company, of Macon, which is constructing the large dam near Jackson, Ga., will also build the dams across the Oconee and Flint rivers. The dam on the Oconee River will be located near Milledgeville, Ga., and will, it is said, be by far the largest waterpower plant in the South and will generate when completed 45,000 horsepower. The dam to be built across the Flint River will be located near Reynolds, in Taylor County, Ga., and will also be one of the largest plants in the South. Work on the latter plant will begin within a month. B.

Hudson River Power Company.

According to the *Wall Street Journal*, a comprehensive reorganization of the eight operating companies which comprise the Hudson River Power Company's system is practically assured. The probabilities are that each of the eight properties will be bought in at foreclosure sale by its bondholders and turned over to one central company.

Application has been made for the Hooper committee for foreclosure of the mortgage on the Hudson River Electric Power Company, the Hudson River Water Power Company and the Hudson River Electric Company. These three companies have $9,202,000 of the entire $11,010,500 outstanding bonds of the entire eight companies. It is probable that request for the foreclosure on the other five will be made in the near future, and that the properties will be bid in by the bondholders.

Matters are slightly complicated by the request before the court that the receivers of the Hudson River Water Power Company be given authority to issue receivers' certificates to pay the interest on the $1,980,000 first-mortgage bonds. This request is opposed both by the Hooper committee and the Lisman committee in New York. The two committees jointly have on deposit nearly seventy-five per cent of the power company's bond issue. The protective committees oppose the issuance of these receivers' certificates, on the ground that the Water company, which in a sense is the keystone of the entire structure, is really bankrupt, and that, although it may be earning the interest on its own bonds, it is not earning enough to pay interest on the Hudson River Electric and Hudson River Electric Power Companies' bonds, which it guarantees. These two guaranteed companies are neither of them earning their operating expenses.

In the reorganization of the Hudson River system it is practically assured that some scaling down in bonds will be required. The actual value of the physical properties, not including rights-of-way or undeveloped properties, has been estimated by Stone & Webster at $6,234,000, which is nearly $5,000,000 less than the outstanding total of bonds.

Important Freight Concessions to Electric Railway by Steam Railroads.

C. T. Chapman, the new traffic manager of the Toledo & Western Electric Interurban Railway, has just secured some important concessions for his road by which the Delaware & Lackawanna, Grand Trunk, Ontario Dispatch, and New York, Ontario & Western Railroads agree to give the Toledo & Western a pro rate on through rates and divisions on freight shipments. The agreement becomes operative on May 1 next.

The Toledo & Western penetrates one of the most important sugar-beet-producing sections of the country, and the bulk of its shipments of sugar beets goes East. The road operates standard-size freight cars, and such cars, loaded at its various stations, are transferred to eastern connections when they reach Toledo. H.

Telephone by Wireless Thirty Miles.

Some successful wireless-telephone experiments were made on April 11, between Paris and Melun, a distance of thirty miles. A radio--telephonic transmitting and receiving apparatus, says a cable dispatch to the New York *Times*, on an entirely new model, invented by Lieutenants Colin and Jeance, of the French Navy, was used.

Lieutenant Colin was stationed at the Eiffel Tower, and Lieutenant Jeance, with M. Picard, the Minister of Marine, at Melun. Newspaper representatives listened to the conversation on the premises of the radio-telegraphic manufacturing company, Boulevard Grenelle.

A headpiece was used which fits completely over the head, shutting out all the noise of the outside world. With this appliance one could hear with great distinctness the conversation between the Eiffel Tower and Melun.

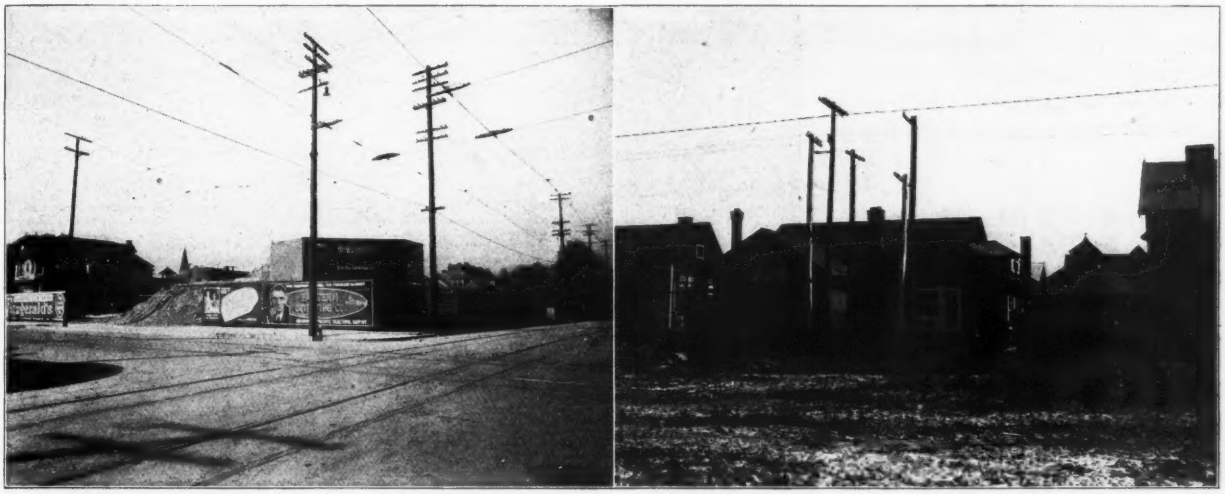
In December, 1907, dispatches from Berlin declared that Valdemar Poulsen had succeeded in telephoning without wires from a suburb of Berlin to Lyngby, near Copenhagen, a distance of 250 miles. The dispatches said that "the sound of music played in Berlin was distinctly heard" at the other end; that messages were twice exchanged, and that the "transmission left nothing to be desired in the way of clearness and audibility."

JOINT POLE OCCUPANCY.

CO-OPERATION—WITH THE UTILITY COMPANIES IN SOUTHERN CALIFORNIA.

Everybody who has visited Southern California during the last decade has no doubt marveled at the wonderful development and growth of this section. Los Angeles has more than tripled its population in that period, and suburban towns have arisen as by magic under the stimulating influence of the finest suburban trolley system in the world.

The demand for utilities, such as light and the telephone, has increased in even a greater proportion, and the operating companies have been taxed to meet the



A Combination Corner. These Combinations, Owned by Four Companies, Extend Two Miles on Grand Avenue and One-Half Mile on Tenth Street.

The Old Method. Five Companies Set Poles Independently on Private Property Lines.

JOINT POLE OCCUPANCY.

Five Companies Unite to Relieve Conditions on this Street, Once the Principal Residence Street of Los Angeles, Now in the Semi-Business District.

Two Telephone Companies and One Lighting Company on Forty-Foot Poles on Private Property Line. This Has Been Adopted as a Standard for All New Realty Subdivisions.

Three 15,000-Volt, Three-Phase Circuits; 6,000-Volt Series Street Lighting Circuits; 500-Volt Railway Feeder; Railway, Telephone and Span Wire.

JOINT POLE OCCUPANCY.

constantly increasing demand for their service. In the city of Los Angeles there are two telephone companies, three lighting companies and four electric-railway systems, all of which are operating independently; having constructed immense distributing systems and branches to many of the outlying towns and cities within a radius of one hundred miles of this southwestern metropolis. Such rapid development was accompanied to a marked degree by the "pole nuisance," which is now being overcome to a large extent.

The Joint Pole Committee of Los Angeles is a committee of representatives of the various utility companies and has for its object the elimination of all unnecessary poles outside of the regular conduit districts established by city ordinance. The Pacific Electric Railway Company, Pacific Light and Power Company, Los Angeles Railway Company, Edison Electric Company, Los Angeles Gas and Electric Company, Los Angeles Pacific Company, Pacific Telephone and Telegraph Company, and Home Telephone and Telegraph Company are actively engaged in this commendable work as well as a number of outside or subsidiary companies, which participate to a lesser degree. The committee has an organization operating in a measure independently from any of the parent companies, but under the jurisdiction of the authorized members selected by the various companies interested. Combinations are arranged for and recorded through the secretary, who handles the details and provides for an equitable settlement on all combinations. The committee was organized for active work February 1, 1907, and during the two years to date have accomplished a great deal toward bettering local conditions. During this period combinations have been made on over 10,000 poles in and around the city of Los Angeles, thus eliminating entirely a much larger number of poles which would have been necessary without combination.

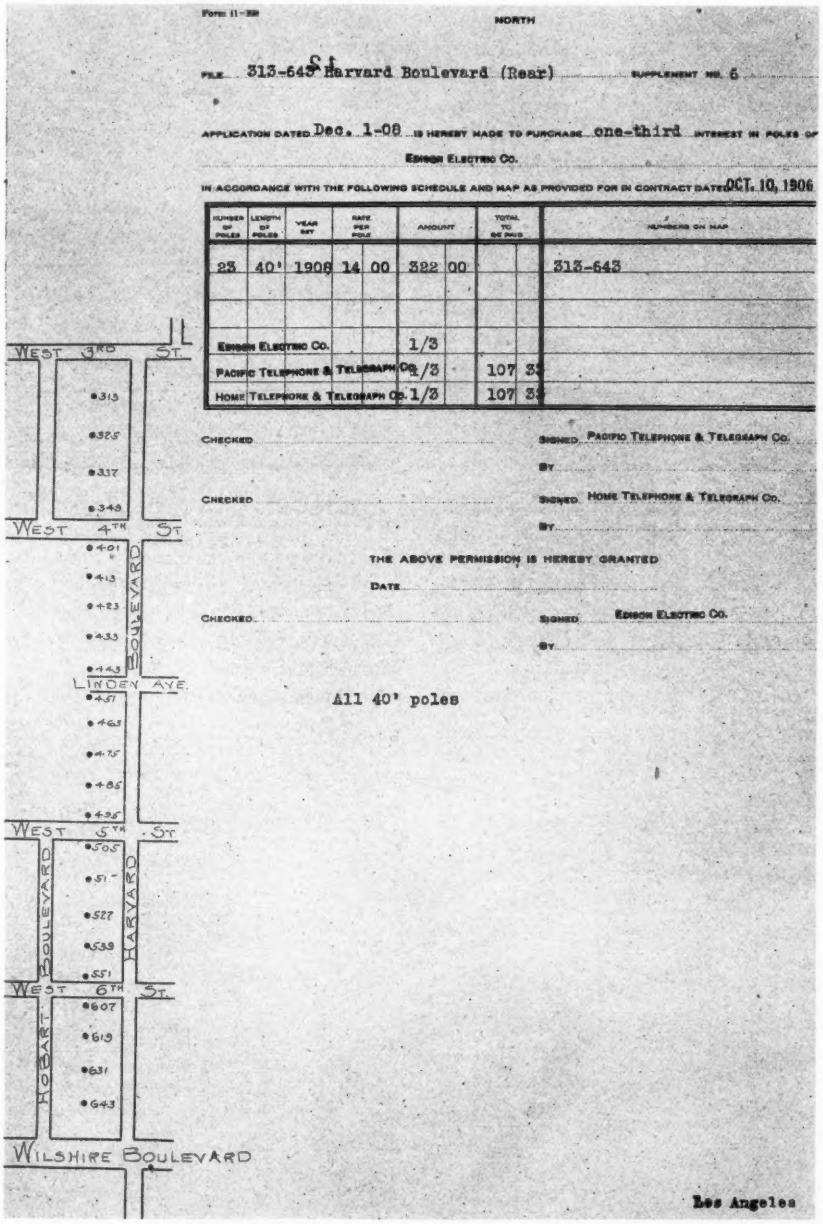
Los Angeles is a city covering a very large area, an extension to outlying sections of the conduit district would be impracticable under the favorable rates given to patrons of the utility companies, and the joint pole proposition has solved this otherwise vexing problem.

Popular agitation with reference to the companies' poles has almost ceased entirely since the adoption of this co-operative method, and has helped the companies themselves in making construction better and cheaper, promoting harmony among the operating officials of the various companies whose business interests must be in direct opposition.

The committee through the secretary relieves the companies of all details relating to joint construction, maintaining with each company at an extremely low cost a duplicate file of all combination work.

In recording combinations a map is made showing the exact location of the poles, each pole having a reference number which corresponds to the house or street number at that particular location. These maps or supplements when approved are filed in a regular vertical street index, prints being furnished all members of the committee. In addition an index card is prepared which gives an exact copy of the information contained in schedule shown on map. These cards are filed in a company index, which is arranged to show the various owners and applicants in combinations. In addition to this each supplement when approved receives its consecutive number, which offers an additional check for reference purposes only.

Among other details which the committee handles successfully is keeping the companies advised of changes in street lines or other public improvements which may affect the various pole lines.


NORTH
313-643 Harvard Boulevard (Rear)
SUPPLEMENT NO. 6
APPLICATION DATED Dec. 1-09 IS HEREBY MADE TO PURCHASE one-third INTEREST IN POLES OF
EDISON ELECTRIC CO.
IN ACCORDANCE WITH THE FOLLOWING SCHEDULE AND MAP AS PROVIDED FOR IN CONTRACT DATED OCT. 10, 1906
NUMBER OF POLES | LENGTH OF POLES | YEAR SET | RATE PER POLE | AMOUNT | TOTAL TO BE PAID | NUMBERS ON MAP
23 | 40' | 1906 | 14 00 | 322 00 | | 313-643
EDISON ELECTRIC CO. 1/3
PACIFIC TELEPHONE & TELEGRAPH CO. 1/3 107 33
HOME TELEPHONE & TELEGRAPH CO. 1/3 107 33
CHECKED
SIGNED PACIFIC TELEPHONE & TELEGRAPH CO.
BY
CHECKED
SIGNED HOME TELEPHONE & TELEGRAPH CO.
BY
THE ABOVE PERMISSION IS HEREBY GRANTED
DATE
CHECKED
SIGNED EDISON ELECTRIC CO.
BY
All 40' poles
WEST 3RD ST.
WEST 4TH ST.
WEST 5TH ST.
WEST 6TH ST.
HARVARD BOULEVARD
HOBART BOULEVARD
LINDEN AVE.
WILSHIRE BOULEVARD
Los Angeles

JOINT POLE OCCUPANCY—ONE OF THE STANDARD FORMS FOR RECORDING SUPPLEMENTS—THREE PARTIES; ONE OWNER; TWO APPLICANTS.

Victoria Falls Power Development.

The Victoria Falls and Transvaal Power Company, Limited, has just increased its capital in London by practically $4,500,000 to extend the service for which optional contracts have been made to the fifteen mines of the Rand Mines, Limited, the latter mines agreeing to take all of their power for twenty years from this hydroelectric and compressed-air power company.

It is proposed to harness the Victoria Falls on the Zambesi River, Africa, and send the power for the greater part of the thousand miles to the Transvaal gold mines at pressures that have been estimated as high as 150,000 volts. This voltage was under serious consideration when the great electrical companies in America were making plans a few years ago. The present plans of the Victoria Falls and Transvaal Power Company involve the development of 270,000 horsepower within a short time, and the engineers say that an assured business of 500,000 horsepower is in sight.

The abridged prospectus of the company, published in the London newspapers, says, in part:

"This company was registered on October 17, 1906, and commenced business in January, 1907. Its prospectus, published on December 15, 1906, stated that 'the immediate supply of the Witwatersrand market must at the outset be the first object of this company.' The present issues of preference shares and debentures are made in connection with the erection of further plant for the fulfillment of new contracts, as mentioned below.

"This company occupies already a pre-eminent position upon the Witwatersrand through the magnitude of the contracts it has secured. In consequence of its large output for mining purposes it will be able to supply power on exceptional terms to townships, railways and industrial corporations in the Transvaal, which, as the development of the country proceeds, may be expected to become considerable customers. It is thus difficult to assign any limit to the company's operations in this important section of South Africa. Similarly, by reason of its rights at the Victoria Falls, the company holds a pre-eminent position in Rhodesia, and the early establishment of metallurgical and other industries at the falls is under consideration, subject to an agreement being entered into by this company for the supply of the necessary power.

"This company, either directly or indirectly, has entered into, or is negotiating contracts with the majority of the important Witwatersrand mines for the supply of their power requirements, and it is now practically certain that the equipment of all new and of many of the developed mines will be electrical.

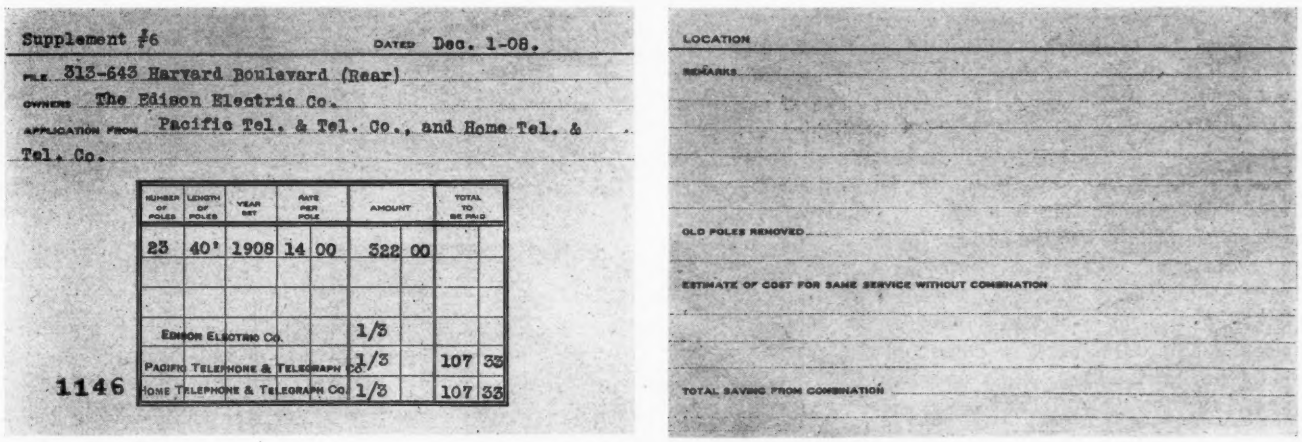
"This company, by contract dated December 2, 1908, with Walter Andrew Harper, acquired a conditional agreement made by him with the Rand Mines, Limited, under which, when the agreement becomes definite, fifteen mining companies controlled by the Rand Mines, Limited, and Eckstein groups will contract to take the whole of their power requirements from a company to be formed for the purpose of supplying them with electricity and compressed air. The company will be formed by the Victoria Falls and Transvaal Power Company, Limited, and will be called the Rand Mines Power Supply Company, Limited. It will be registered in the Transvaal colony and will have a capital of not less than £1,500,000, namely, a share capital of £500,000 in shares of £1 each, and borrowed capital of not less than £1,000,000. The whole of the £500,000 borrowed capital will be advanced by the Victoria Falls and Transvaal Power Company, Limited.

"The Rand Mines Power Supply Company, Limited, will pay £500,000 in cash, the proceeds of the issue of the share capital of £500,000, in part payment of the above agreed price, and the balance of such price will, as stated above, be advanced by the Victoria Falls and Transvaal Power Company, Limited, and will be secured by a first charge, mortgage or debenture as the Victoria Falls and Transvaal company, Limited, may elect.

"The total requirements of the above groups are estimated by them in the near future at not less than 270,000,000 units of power annually. The period of the supply contract is for twenty years, and the Rand Mines, Limited, contract that a minimum annual consumption of 130,000 units shall be taken during the first twelve years.

"Owing to the low prices and advantages which the Victoria Falls and Transvaal Power Company, Limited, and the Rand Mines Power Supply Company, Limited, will be able to offer to customers on so large a consumption, and having regard to the extent of the contracts already entered into and under negotiation, it may be said that a total consumption of nearly 500,000,000 units of power is in sight, seeing that an output of 400,000,000 units within three years is practically already assured.

"It is important to note that the operations of this company will, by cheapening working costs, tend to prolong the life of the fields, as with lower costs immense bodies of low-grade ore now unworked will be treated profitably."



Supplement #6 DATED Dec. 1-08.

FILE 313-643 Harvard Boulevard (Rear)

OWNERS The Edison Electric Co.

APPLICATION FROM Pacific Tel. & Tel. Co., and Home Tel. & Tel. Co.

NUMBER OF POLES	LENGTH OF POLES	YEAR SET	RATE PER POLE	AMOUNT	TOTAL TO BE PAID
23	40'	1908	14 00	322 00	
	EDISON ELECTRIC CO.			1/3	
	PACIFIC TELEPHONE & TELEGRAPH CO.			1/3	107 33
1146	HOME TELEPHONE & TELEGRAPH CO.			1/3	107 33

LOCATION

REMARKS

OLD POLES REMOVED

ESTIMATE OF COST FOR SAME SERVICE WITHOUT COMBINATION

TOTAL SAVING FROM COMBINATION

JOINT POLE OCCUPANCY—INDEX CARD—REVERSE SIDE FOR RECORDING SPECIAL INFORMATION. (See page 752.)

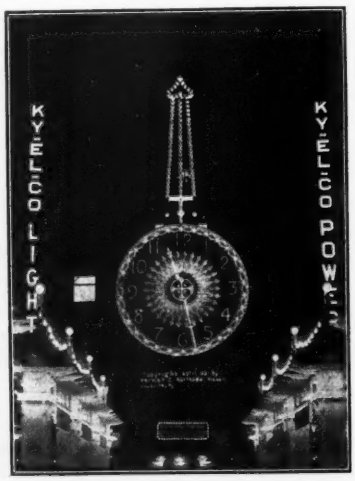
Southern Electrical and Industrial Exposition.

The first Southern Electrical and Industrial Exposition was opened very successfully on Monday, April 12. The attendance on the opening day and during the two weeks following was byond the expectation of the management, and the exhibit spaces were well filled with comprehensive displays of electrical, mechanical and industrial demonstrations.

The First Regiment Armory, where the exposition was held, is one of the largest structures of its kind in the country. The electrical illumination was particularly attractive and the accompanying illustrations give some idea of the extent to which these features were carried out. In addition to the decorative features inside of the building there was an elaborate street illumination of Walnut Street and Fourth Avenue, leading to the exposition headquarters. Inside of the building the ceiling was draped with dark green bunting, excluding natural light, the illumination depending entirely, day and night, upon the electric lighting. Among the features of the interior decorations was an electric tower which rose to a height of forty feet, several thousand incandescent lamps being used in the illuminating scheme.

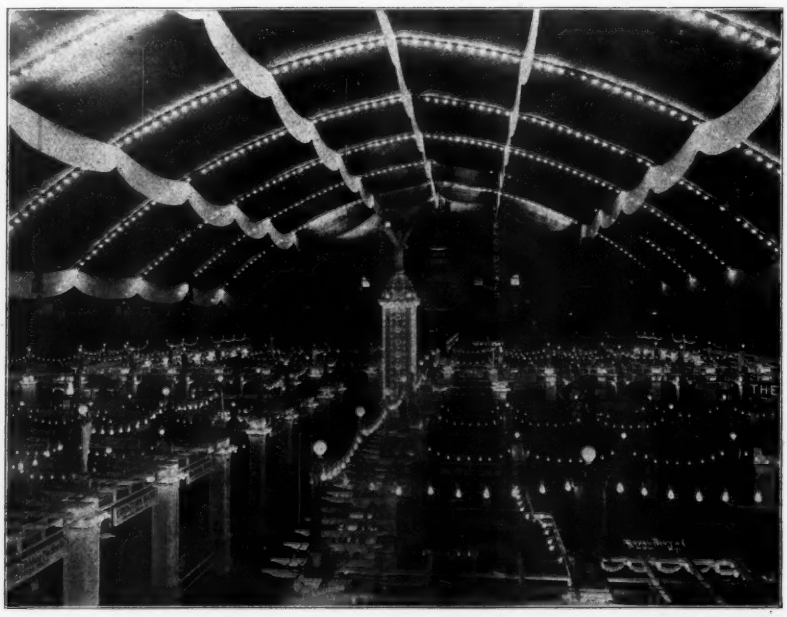
Another feature was the electric clock, an illustration of which is shown herewith. This clock was designed and made by H. C. Korfhage of Louisville. The clock was in form of a pendulum and hung from the ceiling at the south end of the armory. The pendulum was forty-eight feet long, twenty feet, three inches wide and weighed over 3,000 pounds. There were 5,500 multi-colored lamps. The dial was twenty feet, three inches in diameter. The time by minutes was indicated by sixty series of lights, each containing thirty-two bulbs running radially from an ornamental centerpiece to the outer edge of the dial. Shorter rows of different colored lights indicated the hours and these changed their position twelve times during each sixty minutes. The seconds were shown by sixty lights placed at equal distance around the extreme outer edge of the face. The hour figures were about three feet high and each second the illumination in the outer circle of lights moved forward by one digit. The hour hand made its journey at five-minute intervals. The clock movement was controlled from a master clock which also formed part of the system installed by Mr. Korfhage. A movement is under way to purchase this clock so that it may be retained in Louisville.

There were some special occasions marking each day and night during the exposition. Among the electrical exhibits the following were prominently in evidence:



THE ELECTRIC CLOCK.

The James Clark, Jr., Electric Company, Louisville, Ky., showed a complete line of motor-driven drills, tool grinders, lathes, emery wheels and hacksaws operated by Willey motors. These motors are built directly into the tool. Another part of the space was devoted to a complete line of the company's motors and generators, all operating, a great deal of attention being given to the 125-kilowatt "Willey" generator. The latter machine was one of three to be furnished to the new Kentucky State Capitol at Frankfort. There was also a large sample board showing Bryan-Marsh incandescent lamps and a sample board showing the lamps of the Colonial Electric Company of Warren, Ohio. The demonstrations of electrical heating appliances at this booth were greatly admired. The company represents the American Electrical Heater Company of Detroit. There was also an exhibit of arc clusters and other specialties made by the Benjamin Electric Manufacturing Company, Chicago, and the specialties of the Marshall Electric Company of Boston, Mass. A large glass enclosed model of the Cutler-Hammer Manufacturing Company's new switch was shown and also a line of Pass & Seymour Company's specialties. A line of devices and auxiliaries manufactured by the George Cutter Company of South Bend, Ind., were shown, and in addition to these the specialties of the Nungesser Dry Battery Company; the transformers of the Kuhlman Electric Company for sign operation with low-voltage tungsten lamps and the renewed lamps of the Economy Electric Company of Warren, Ohio. The Chicago Fuse Wire and Manufacturing Company showed a complete line of outlet boxes, fuses and other specialties, and the lines of the National Carbon Company and the Holophane Company were well shown. This was one of the most attractive and effective booths in the exposition.



GENERAL VIEW, SOUTHERN ELECTRICAL AND INDUSTRIAL EXPOSITION.

The Marconi Wireless Telegraph Company maintained stations at both ends of the building and exhibited its high-powered apparatus.

The exhibition of the Louisville Light-

ing Company was particularly attractive and its representation of the "house electrical" was decidedly satisfactory.

The General Compressed Air and Vacuum Machinery Company exhibited the Thurman portable electric vacuum cleaner.

The Englewood Electric Supply Company exhibited a full line of flash lights, scarf pins, clocks and pocket cigar lighters.

The Westinghouse Electric and Manufacturing Company was in evidence with many of its examples of motor-driven electric fans, arc lamps for interior and exterior service and incandescent lighting.

The Sterling Electrical Manufacturing Company of Warren, Ohio, was efficiently looked after by H. A. Tullidge.

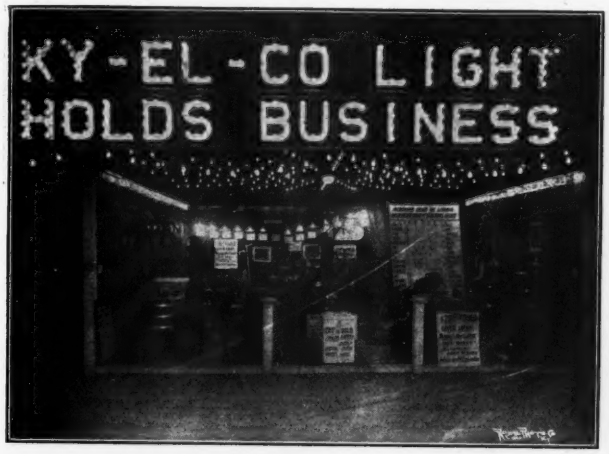
The Brilliant Electric Company of Cleveland, Ohio, made a very attractive lamp display in connection with the exhibit of the Cooper Hewitt Company of Louisville. H. H. Cudmore, president and general manager, was an interested visitor and the friends of the Brilliant company were well taken care of by Frank B. Galloway, field manager.

The Nernst Lamp Company of Pittsburg, Pa., was looked after by J. L. Anderson, district manager. An attractive display of Westinghouse-Nernst lamps and chandeliers was made. A fancy Duretta housing lamp with a sixteen-inch pear-shaped ball attracted a great deal of attention. The body of this lamp is made especially large to conform symmetrically with the globe which gives a desirable distribution curve. A large reproduction of the company's screw-burner trademark brought out the particular features of this system of lighting. At the request of the director of the art exhibit, Westinghouse-Nernst single-glower lamps, equipped with standard window reflectors, were used to illuminate the oil and water-color exhibits.

The Kentucky Electric Company's exhibit was brilliantly illuminated, occupying in its three exhibits about 1,000 square feet of wall space and 600 square feet of floor space. Demonstrations were made of ironing, washing, freezing, grinding and sweeping machines, and there was also a display of sign lighting, outlining and decorative incandescent lamps; the "Linolite" system of the H. W. Johns-Manville Company was shown here.

An attractive display of telephone apparatus was made by Herman C. Tofel of Louisville. There was also a full line of Mathias Klein & Son's tools and specialties.

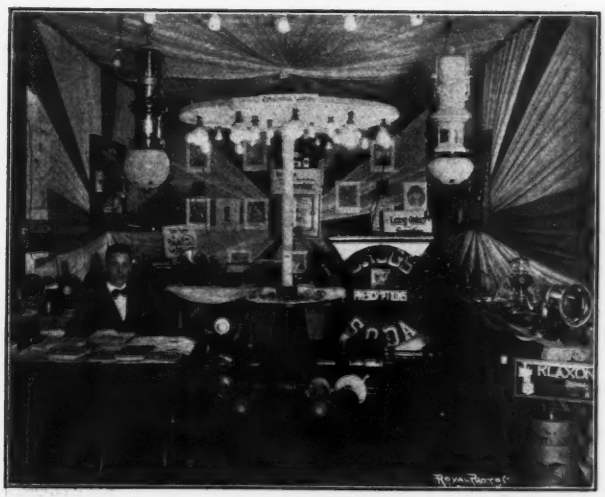
The American Machinery Company exhibited examples of its direct-current passenger elevators of the full magnet type. The company also exhibited a line of its controllers for freight and passenger elevators which has recently been brought out. The company also manufactures ice and refrigerating machinery of the absorption type, and one of its ammonia



KENTUCKY ELECTRIC COMPANY.

JAMES CLARK, JR., ELECTRIC COMPANY.

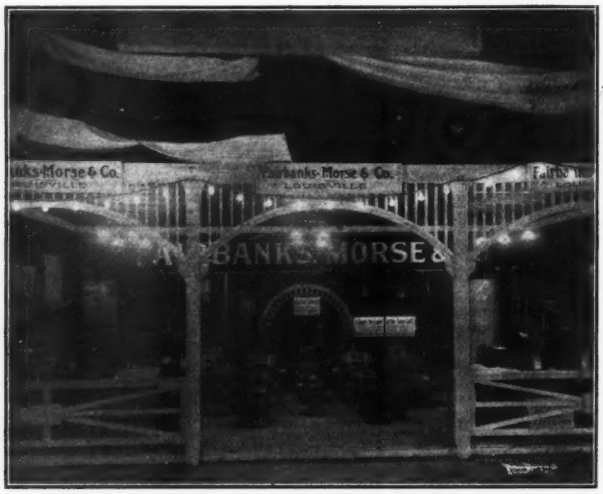
LOUISVILLE LIGHTING COMPANY.



H. I. WOOD COMPANY.

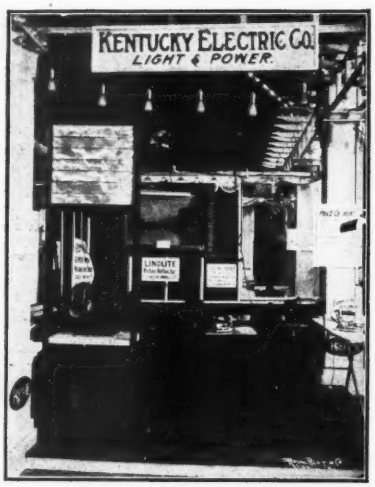
pumps was in operation at the exposition. The company also showed a number of valves and fittings and photographs of refrigerators it had installed.

The Electric Renovator Manufacturing Company of Pittsburg, Pa., showed a line of commercial and domestic types of "Invincible" electric renovators. The exhibit was looked after by H. F. Wilcox, agent for Kentucky and Tennessee.

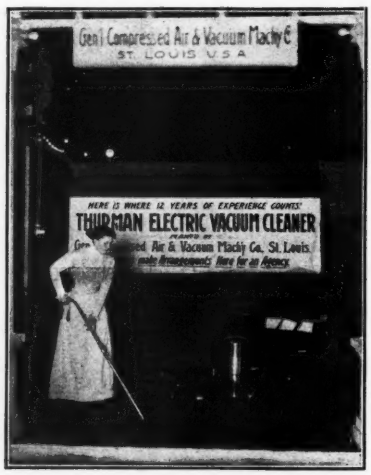


FAIRBANKS-MORSE & CO.

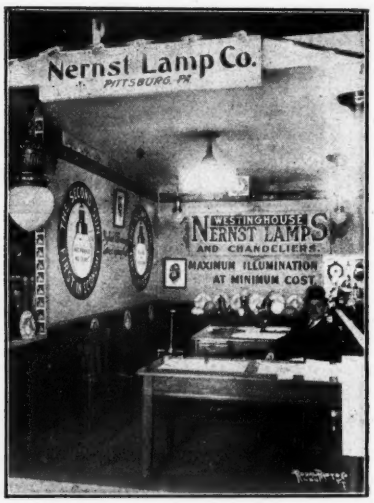
ELECTRIC RENOVATOR MANUFACTURING COMPANY.



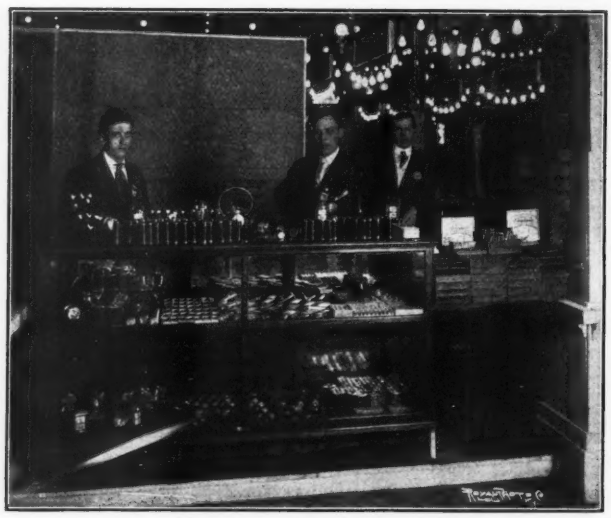
KENTUCKY ELECTRIC COMPANY.


Gen'l Compressed Air & Vacuum Machy Co
ST. LOUIS U.S.A.
HERE IS WHERE 12 YEARS OF EXPERIENCE COUNTS!
THURMAN ELECTRIC VACUUM CLEANER

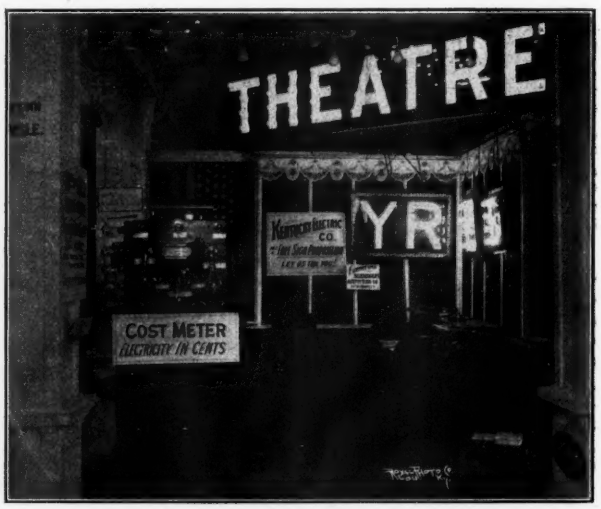
GENERAL COMPRESSED AIR AND VACUUM MACHINERY COMPANY.



NERNST LAMP COMPANY.



ENGLEWOOD ELECTRIC COMPANY.



KENTUCKY ELECTRIC COMPANY.

The Harry I. Wood Company made an interesting exhibit of Simplex electric

heating and cooking apparatus, Columbia incandescent lamps, Stave flaming-arc lamps, Pyro signs, Arnold vibrators, Del curling-irons, fuses, switch boxes and specialties of the Chicago Fuse Wire and Manufacturing Company and the National Metal Moulding Company and Klaxon signal horns, Equipose telephone holders, telephones, motors, ignitors and electrical supplies of every description.

The Fairbanks-Morse Company had a fine exhibit of alternating-current motors and generators, also feed pumps and portable and marine gasoline engines.

The apparatus of the General Electric Company was in evidence in the form of turbines, motors, generators, centrifugal pumps, arc and incandescent lamps, and heating and cooking apparatus.

The Stromberg-Carlson Telephone Manufacturing Company made an exhibit of a full line of central energy, generator call, intercommunicating, interurban railway and mine telephone apparatus. The Louisville Home Telephone Company occupied a space with the Stromberg company and they used a private branch Stromberg board, giving telephone service within the exposition and over trunk lines to the Louisville Home Exchange and long-distance lines.

The "Firefly" flasher, manufactured by the C. O. Schneider Company, Chicago, and which was used to twinkle the "stars" at the recent Chicago Electrical Show, was used by exhibitors as an attraction device.

Among those in attendance were J. H. Bell, Electric Appliance Company; F. H. Sparks, Nernst Lamp Company; Leon H. Frank, Mutual Electric and Machine Company; Arthur O. Einstein, Crescent Company; H. W. Dickerman, Waverley Company; C. C. Lewis, Columbia Incandescent Lamp Company; A. K. Baxter, Van Dorn Electric and Manufacturing Company; C. L. Hight, Henry D. Sears Company; T. T. Barnett, Bryan-Marsh Company; R. E. Crockett, chief engineer Indiana Reformatory; Henry J. Wigge, James Clark, Jr., Electric Company; E. C. Campbell, H. W. Johns-Manville Company; H. E. Watson, Benjamin Electric Manufacturing Company; E. O. Munson, Stromberg-Carlson Telephone Manufacturing Company; Leon J. Crane, Colonial Electric Company; Henry P. James, Cutler-Hammer Manufacturing Company; T. T. Barnett, Bryan-Marsh Company; R. I. Phillips, Cutler-Hammer Manufacturing Company; W. C. Wing, Brilliant Electric Company; J. B. Wilkinson, Stromberg-Carlson Telephone Manufacturing Company.

Electrical Equipment of the Gary Steel Plant Discussed in Chicago.

On the evening of April 16 a joint meeting of the Chicago Section of the American Institute of Electrical Engineers and the Electrical Section of the Western Society of Engineers was held in the rooms of the latter in the Monadnock Block. Notwithstanding the weather, the meeting proved to be the best attended one ever held in these rooms, there being over 230 present. B. R. Shover, electrical engineer of the Indiana Steel Company, was the principal speaker of the evening. He gave a very interesting illustrated talk on the electrical equipment of the Gary steel plant. Most of his remarks were a résumé of his paper on this topic read before the Institute at New York on March 12, which has been abstracted in these columns in the issues of April 3, 10 and 17.

Mr. Shover rapidly traced the development of the Gary plant, which has sprung from the sand dunes at the south end of Lake Michigan into a 1,280-acre tract that has attracted the attention of the world on account of its scope as well as its equipment and operative methods. He called attention to the fact that, aside from the extended use of gas engines and electric motors, the plant is unique as a steel works in that it was built from the start on a large scale, embodying the most advanced and economical ideas in steel making. After giving an outline of the general layout he spoke at length about the prominent features of the electric power station, particularly about the good results obtained from the gas engines and storage-battery regulating system.

In explaining why about 22,000 horsepower in direct-current motors was installed, he said the electrical features of the plant were the only ones which were in a sense experimental in that complete electric driving of rolling mills had never been carried out before. Therefore to keep down the experimental features in this line it was deemed advisable to use direct-current motors where such motors had been proved to be peculiarly suitable, although as soon as alternating-current motors are shown to be equally serviceable they will doubtless be substituted and the plant run almost completely by alternating current. Great care was bestowed on making perfect ground connections throughout the plant. On top of the transmission towers a three-eighth-inch galvanized steel cable was strung and grounded at each tower. The protection against lightning was made as complete as possible and no trouble has been experienced therefrom.

Speaking of the rail mill, Mr. Shover declared it was not only the largest in the world but the first in which the electric motor had completely replaced the steam engine. To make the control of the motors "foolproof" and at the same time simpler, automatic remote control was adopted and had given excellent results. The entire operation of this mill with all its rolls, tables, saws and other machinery was in the control of but eight skilled operators. Every precaution that could be devised to insure continuous and yet safe operation of the machinery had been provided. For example, what was termed a "mechanical fuse" was installed on all the main motor bearings to guard against their possible displacement by the enormous strains caused by a rupture of the main shaft when a piece of cold steel is run into the rolls. Another safeguard referred to was the provision for rapidly stopping the main motors in emergencies, since they were mounted and balanced so perfectly that without it from one-and-one-half to two hours were required to bring them to rest.

In opening the general discussion of the subject, James Lyman, of the General Electric Company, referred to the great contrast in the steel-making methods of twenty years ago and now. Probably the most striking feature was the utilization of blast-furnace and coke-oven by-products. It has been found that about twenty-five per cent more gas was available from the blast furnaces than is required for the generation of all the power used about the plant. Experiments are therefore being instituted to utilize this surplus power in the form of electrical energy for operating electric furnaces in direct steel making.

J. M. S. Waring, of the Electric Storage Battery Company, described the action of the Woodbridge type of split-pole rotary that is used in the plant to enable the storage battery to take up fluctuations of the alternating current as well as direct-current systems.

C. T. Henderson, of the Cutler-Hammer Company, spoke of the special features that had to be considered in the design of the large 10,000-ampere circuit-breaker. He also emphasized the importance of automatic motor control throughout the various mills of the plant, and especially in the rail mill.

Among various questions that Mr. Shover was called on to answer was one relative to the plan proposed by some

engineers in place of using such a large number of gas engines. This was to use the gas under steam boilers, from which a much smaller number of steam turbo-generators of large capacity and small bulk could be supplied. Mr. Shover declared that while this plan had some advantages in lower original cost and cost of attendance and upkeep, these had been weighed against the amount of coal that would be required to make up the deficiency in gas.

Near the close of the meeting Chairman W. L. Abbott, of the Chicago Section of the American Institute, announced that plans had been made for an inspection visit to Gary on Saturday, April 24, for the benefit of members of the two societies and their friends.

Electric Automobiles for New York Postal Service.

At midnight on April 14 the New York general postoffice inaugurated for the first time the carrying of mails in that city by automobile. Four electric machines have been purchased for the purpose.

The territory to be covered by the new service embraces College, M and Washington Bridge stations, but the service will probably be extended soon to include Station J, at Eighth Avenue and One Hundred and Twenty-fourth Street, from which point close connection can be had by pneumatic tube with the Grand Central Station and the general postoffice. The new schedule at first calls for trips to be made every half hour. Postmaster Morgan anticipates that the new motor service will materially facilitate the collection of mails in this city. The service will be extended from time to time as circumstances require and as the success of the machines is demonstrated.

Proposed Patent Law Amendment.

A bill to amend the patent laws of the United States has been introduced in the House of Representatives by Mr. McEnery. This bill provides that all letters patent, or interest in letters patent, that may in the future be granted by the United States, the ownership of which belongs to the original inventor, shall be exempt from seizure for debts, except voluntarily contracted by the inventor by a mortgage or pledge of the letters patent. This exemption would not apply to the proceeds arising from the sale of the letters patent, nor to any product of the letters patent which is not connected with the letters patent.

THE DETERMINATION OF THE DISTANCE AND THE DIRECTION OF A SENDING STATION BY WAY OF BARRETTER-MEASUREMENT.

BY BELA GATI.

In the collision of the ship Florida with the Republic, the advantages of the wireless telegraphy became generally proved. Since this time it became a law in the United States that every ship which comes into an American harbor is compelled to be fitted up with wireless-telegraphy apparatus. Nevertheless, although the Baltic, Lucania, La Lorraine, Furnesia and Seneca were fitted up with wireless telegraphy, without the wonderful presence of mind of Operator Binns, the rescue of the Republic would doubtless have been a failure. Certainly, it is almost superhuman to telegraph ten to twenty hours continually on a sinking ship; if one takes into consideration, besides the above-named ships, the message to the shore stations, Sagapano, Long Island, Siasconset on Nantucket Island, and South Wellfleet, the services of Mr. Binns seem to be so great and unsurpassable as not to be hoped for a second time, not even from the present highly trained staff of the Marconi company.

It would be much better if, by way of automatic signals, it were made possible for the sinking ship to give notices of its distance and direction, to other vessels. In case of the telegraph operator having sustained injury, a sailor could always give the letter *t* during one-minute intervals, and this would quite suffice to determine the distance and direction of the imperiled ship. Of course, if other ships are fitted up with any system of the so-called directive antennæ, the matter hardly needs more explanation. I want to show the case, only, when the rescuing ship has an ordinary antenna.

According to Duddell's rule, the distance between sender and receiver, multiplied by the strength of the incoming current, is a constant number. This rule was proved by Duddell in greater distances; this is also good for shorter.[1]

Should, for instance, this constant be 10,000 kilometre-micro-amperes, on

50 kilometres, one gets 200 micro-amperes, on

47 kilometres, one gets 212.7 micro-amperes, and on

53 kilometres, one gets 188.6 micro-amperes.

These values can be measured conveniently enough by the pointer galvanometer of the Gati barretter-measuring set. For example, the rescuing ship, let us say, the Baltic, measures the incoming current 200 micro-amperes, and, if after the run of three kilometres of its original course, the measure gives again 200 micro-amperes, the Baltic knows that she is not nearing the Republic. Now, if the Baltic changes her course perpendicularly to the former, and after three kilometres gets 212.7 micro-amperes, the Baltic will know she has gotten into the right course, and that the distance is now forty-seven kilometres. One can always determine the distance of the imperiled ship by two measurements which were made in different courses by some calculations. It is not even necessary to know the constant, for it can be determined eventually by repeated measurements.

If the sinking ship does not uphold her emission of waves constantly, one must measure repeatedly.

By all means, it would be good to examine all the wireless stations in regard to the Duddell rule. The constant gives, so to say, the efficiency of the station.

Although the damping measurements, as Hähnemann[2] writes, have only been taken into consideration since 1906, and the proposed constant measurement is not put into use till now, still, it seems to me that the former ordinary aversion of measurements by the wireless companies are pretty much fallen, so, if not in the interest of the passengers, as well as the companies, still just as with the wavelength, the compulsory measurements in this line out to be introduced.

[1] Bela Gati, Physikalische Zeitschrift, 8, p. 630.

[2] Walter Hahnemann, Jahrbuch der drahtlosen Telegraphie, 1909, p. 294.

London Underground Sues Yerkes Estate.

Judge Ward, in the United States Circuit Court at New York, on April 6, appointed Harrington Putnam, of the law firm of Wing, Putnam & Burlingham, New York city, receiver of the estate of Charles T. Yerkes, the Chicago traction man, in an action brought by the London Underground Railway Company.

The action is what is known as a general creditor's suit, and is brought by the London company, which controls the tube which Mr. Yerkes built, on behalf of itself and all creditors.

The receiver is appointed to administer the property belonging to the estate in New York city. The claim of the London Underground amounts to $800,000, and represents what Mr. Yerkes owed on his stock holdings in the company at the time of his death.

New York Section, Illuminating Engineering Society.

The monthly meeting of the New York Section of the Illuminating Engineering Society was held on Thursday, April 15, at the Engineering Societies Building, and, in spite of a change in the date of the meeting, the attendance was unusually good.

E. L. Elliott called the meeting to order, and after the routine business had been taken care of, H. Thurston Owens, of the committee on papers, proposed that the general society be invited to hold its annual convention in New York city at the time of the Hudson-Fulton Centennial, early in October, which was seconded and unanimously carried.

The first paper of the evening was presented by Alfred A. Wohlauer, entitled "The Calculation and Design of Illumination." The author called attention to the small amount of data available for the calculation of illumination, and stated that, in the majority of cases where calculations were necessary, uniform illumination was the chief desideratum. After a short explanation of the various factors, he referred to the formula which he introduced nearly a year ago covering the number of lamps necessary to obtain uniform illumination.

FORMULA.

$$N = \frac{I \times S}{A \times L_s}$$

Where

N = Number
I = Intensity of illumination,
S = Surface in square feet
A = Factor of absorption by reflectors
Ls = Mean spherical candlepower.

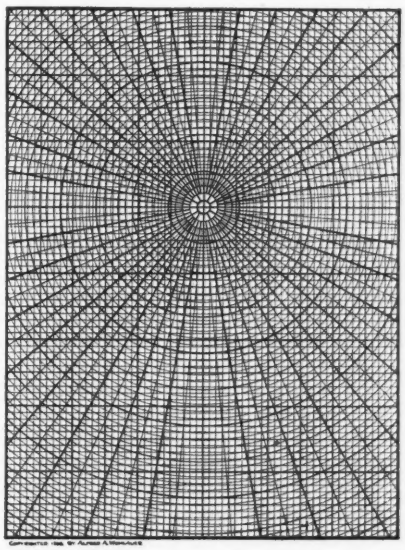
He criticized the "lumens per watt" formula brought out by Cravath and Lansingh in that it referred to the lamp efficiency, whereas the formula above refers to the efficiency of the installation. He stated that reflections from walls and ceiling need only be considered in small rooms, as in large rooms this was a negligible quantity, owing to the decrease in efficiency owing to dust, etc.

He also called attention to the fact that where a high suspension and large number of lamps are employed the type of reflector did not matter, as the light would overlap and it was simply a question of the efficiency of the reflector which determined the number of lamps to be used.

Light sources are usually points for circles, whereas objects to be illuminated are usually in a square or rectangle, which makes it difficult to obtain absolute uniformity in the intensity of illumination.

The author then presented his "Flux of Light" paper, by the use of which the flux available within any angle determined by the height of suspension could be readily obtained, and in the discussion which followed J. S. Codman called attention to the fact that the same results could be obtained by using a scale to fit ordinary polar diagram paper, especially where the scale agreed with the divisions on an ordinary one-inch ruler.

The second paper of the evening was presented by Norman Macbeth, entitled "The Efficiency of the Small Mantle



EXAMPLE OF "FLUX-OF-LIGHT" PAPER.

Burner." The burner under discussion consists of a single unit comprised of burner, mantle and mica chimney which has a horizontal candlepower of 47.6, consuming 1.66 cubic feet of gas per hour at a pressure of two-and-one-half inches.

The author presented a chart showing the lumens per 100 feet of gas and the lumens per watt as compared with other gas and electric illuminants, among which were the following:

8-candlepower, 3.5-watt carbon incandescent	3,140
40-candlepower, 1.25-watt tungsten incandescent	7,690
Small upright gas lamp	26,250

Another chart showing the effect of pressure upon the small burner was presented:

From—	Consumption of Gas, Per Cent.	Amount of Flux, Per Cent.
1 inch to 2 inches, increase	6	15
1 inch to 3 inches, increase	12	34
1 inch to 4 inches, increase	21	46
1 inch to 5 inches, increase	28	57

Referring to candlepower depreciation the author stated that tests made of a Welsbach and a cheap mantle showed the following results:

	Welsbach, Per Cent	Cheap Mantle, Per Cent.
For the first 100 hours	10	11.8
For 100 to 250 hours	6	9.5
For 250 to 500 hours	12	22.6
For 500 to 1,000 hours	8	52.5

During the discussion V. R. Lansingh referred to a paper which he presented some time ago covering specifications for testing of gas mantles and desired to know if anything had been done along those lines.

Mr. Macbeth replied that, although nothing had been done, it was undoubtedly desirable that specifications be adopted.

Mr. Owens stated that probably the reason nothing had been done along these lines was because mantles are being continually improved and that, owing to the wide discrepancy between the cost of gas and electric lighting, the custom was becoming general among gas companies to maintain lamps on a rental basis and the prices amply covered even the poor quality mantle.

P. S. Millar criticized the figures presented by Mr. Macbeth as being laboratory conditions and not those of actual service, where the effect of changes in pressure manifestly altered the conditions.

In reply Mr. Owens stated that gas pressures were maintained in a manner comparable with voltage regulation, and Mr. Millar then called attention to a number of tests which he had recently made in a number of central stations where the voltage regulation had not altered over five per cent.

Mr. Macbeth stated that it was not a question of percentage, due to the fact that in the case of carbon lamps ninety per cent of the life is lost if the voltage is increased ten per cent, whereas gas mantles will stand many times this amount.

The May meeting is to be held in the Twenty-second Regiment Armory in connection with a municipal art exhibit, when E. L. Elliott will read a paper on "Art in Exterior Lighting," the date being May 6.

Auto Show in South

Preliminary arrangements for an automobile show to be held in Atlanta, Ga., next fall or winter have been made at the New York headquarters of the National Association of Automobile Manufacturers, under the auspices of which organization the exposition will be conducted.

Spring Meeting of the American Society of Mechanical Engineers.

The American Society of Mechanical Engineers will hold its spring meeting in Washington, D. C., May 4 to 7. Professional sessions will be held at which papers on the conveying of materials, gas power engineering, steam turbines, the specific volume of saturated steam, oil-well pumping and various other subjects will be discussed.

At the reception, which will be held in the New Willard Hotel, an address of welcome will be made by the Hon. B. F. Macfarland, president of the Board of District Commissioners, with a response by Mr. Jesse M. Smith, president of the society.

During the convention President Taft will hold a reception for the members at the White House. The War Department will give a special exhibition drill of the United States troops at Fort Myer, to which the members and guests will be invited. At the same time, if the conditions are favorable, an ascension of a dirigible balloon will be made and probably also that of an aeroplane.

An address will be given by Rear-Admiral Melville, retired, past-president of the society, and former engineer-in-chief of the Navy, the subject being "The Engineer in the Navy." This evening will be made the occasion for the presentation to the National Gallery of a portrait of Rear-Admiral Melville, presented by friends and admirers. It will be received for the National Gallery by Dr. C. D. Walcott, secretary of the Smithsonian Institution.

F. H. Newell, director of the Reclamation Service, will deliver an illustrated address on "Home Making in the Arid Regions." Trips will be made to various points of interest about the city.

The papers to be presented are as follows: "A Unique Belt Conveyor," Ellis C. Soper; "Automatic Feeders for Handling Material in Bulk," C. Kemble Baldwin; "A New Transmission Dynamometer," Prof. Wm. H. Kenerson; "Polishing Metals for Examination with the Microscope," A. Kingsbury; "Marine Producer Gas Power," C. L. Straub; "Operating System for a Small Producer Gas Power Plant," C. W. Obert; "A Method of Improving the Efficiency of Gas Engines," T. E. Butterfield; "Offsetting Cylinders in Single-Acting Engines," Prof. T. M. Phetteplace; "Small Steam Turbines," Geo. A. Orrok; "Oil-Well Tests," Edmund M. Ivens; "Specific Volume of Saturated Steam," Prof. C. H. Peabody; "Some Properties of Steam," Prof. R. C. H. Heck; "A New Departure in Flexible Staybolts," H. V. Wille.

A discussion on safety valves follows after the paper by Mr. Ivens.

Seattle-Spokane Electric Road.

Official announcement is made by Colonel Albert M. Dewey, of Spokane, president of the Okanogan Electric Railway Company, that French capitalists have taken over a bond issue of $3,000,000, the money from which will be used to build a line from Nighthawk, in north central Washington, to a point near the head of navigation on the Columbia River, seventy-five miles, affording communication with the outside, for a rich lumber, mineral and agricultural district not now served by a railroad.

The road will also be extended east to Spokane and west to Seattle, making a system of more than 500 miles, for the construction and equipping of which Colonel Dewey says ample capital has been secured, adding:

"We have had engineers in the field several months, running preliminary surveys for an electric railway from Spokane to Seattle, and are now looking for a feasible pass through the Cascade Mountains, near the west fork of the upper Methow River.

"I have interested capitalists in the line, and if we can find the right pass we shall build by way of Bridgeport and the Methow Valley and down the Skagit River to a point which will give us a connection with the Great Northern Railway at Rockport, going thence into the Sound cities. We have a fifty-year franchise, right-of-way and charter.

"The line will pass through Loomis, Okanogan, Ophir, Malott, Brewster and Riverside. It will connect at the north end with Victoria, Vancouver & Eastern extension of the Great Northern Railway, thus giving us Spokane connection on the east and the Sound cities on the west. We want direct communication with Seattle and Spokane, and we are now running a line of survey to secure a feasible route with that end in view."

Charges Against Chicago City Railway.

As a result of an investigation recently ordered by Mayor Busse, the firm of Price, Waterhouse & Company, certified auditors, has made a report in which it is alleged that the city of Chicago has been deprived of greater profit in the operation of the Chicago City Railway.

Convention of the Electrical Contractors.

The ninth annual convention of the National Electrical Contractors' Association will be held at the New Boody House, Toledo, Ohio, on July 21, 22 and 23. The convention will be run on the same general plans as the last one. There will be no exhibits or advertising features of any kind.

Preliminary arrangements for the meeting contemplate the following general programme: July 20 — Directors' meeting. July 21—Open session at 10 a. m.; business session at 2 p. m.; meeting of the Ladies' Auxiliary Association; ladies' trolley ride in the evening. July 22—Open session at 10 a. m.; business session at 2 p. m.; ladies' trolley ride up the scenic Maumee Valley in private cars; men's banquet and ladies' banquet in the evening. July 23—Boat ride to Sugar Island Park, Detroit River, where the ball game between the eastern and western teams will be held; dinner on the boat.

The local arrangements for the meeting are in charge of a committee consisting of M. W. Hansen, Emil Grah and Charles M. Eddy of Toledo. The secretary of the association is W. H. Morton, 41 Martin Building, Utica, N. Y.

Electrical Supplies for the United States Navy Department.

The Bureau of Supplies and Accounts, Navy Department, Washington, D. C., will open bids on the dates specified, for the following electrical supplies: April 27. Six hot-wire ammeters, twenty electric heaters, 40,000 feet of single-conductor wire, for delivery at Brooklyn (N. Y.) Navy Yard; 15,000 feet of lighting wire, 4,100 pounds of wire, for delivery at Norfolk (Va.) Navy Yard. May 4. 200 feeder boxes, 1,000 feet of telephone cable, seventy-five pieces of carbon plate for brushes, 2,000 feet of iron conduit, lamp cord, for delivery at Brooklyn Navy Yard; fifty-four soldering irons, for delivery at Philadelphia (Pa.) Navy Yard; micanite plate, 100 pounds of red fiber rod, 100 pulling sleeves, 500 lamp sockets, supplies, 1,000 pounds of rubber tape, 300 feet of red fiber tubing, twelve voltmeters, copper wire, for delivery at Brooklyn Navy Yard. Where quality is not stated the amount is stated as "miscellaneous." Applications for the numbered schedules pertaining to the above may be obtained from the bureau or upon application to the Navy Pay Office nearest each navy yard.

Bay State Trolley Plan.

It is stated officially that the only important change made by the New England Investment and Security Company on its Massachusetts trolleys is the retirement of President Mellen, of the New Haven company from all official connection with the corporation. Certain securities of the Worcester, Webster and Dudley street-railroad companies will be sold, but the lease of these properties will be held.

The trolley holdings will have almost the same standing as the Boston & Maine in its relations to the New Haven corporation.

The trolleys concerned consist of sixteen roads, with 565 miles of tracks, capital stock of $11,625,000, and a debt of $3,234,000, and represent one-fifth of the total mileage of the Massachusetts electric railways.

Electric Block System for the Boston & Maine Railroad.

A new supply station and headquarters is in course of erection at Athol, Mass., to be used in connection with the new electric-signal system which will be installed on the "Athol Branch" of the Boston & Maine Railroad.

The new structure is to be built opposite the local depot. The Athol division of the service will extend as far east as Royalston and west to Orange. There will be two employes in charge of this section, a battery man and a maintainer. The new building will be used to store batteries and wire and will have a small office.

Suspension Railway for Bustleton, Pa.

It is proposed to erect a suspension railway, which, if built, will be the first in the United States, along Bustleton Avenue, between Frankford Avenue and the Bustleton Turnpike Road, near Philadelphia. The title of the company is the Bustleton & Byberry Suspension Railway Company, and the parties interested are the same who have been seeking a surface franchise over the same route.

New Jersey Trolley Freight Bill Passed.

The amended Gaunt trolley freight bill has passed the New Jersey House. As the bill now stands no unlimited franchise is given, and municipalities can regulate the hours during which freight may be carried through the streets. Some of the objectionable features pointed out by the governor in his first veto are said to be still in the bill.

JOHN CHAMBERLIN FISH.

A LEADING INCANDESCENT-LAMP MANUFACTURER AND PROMINENT BUSINESS MAN PASSES AWAY.

Mr. John Chamberlin Fish, well known to the electrical industry as president of the National Electric Lamp Association and of the Shelby Electric Company, passed away suddenly on Friday, April 16, after an illness of only four days. He was born in Sheldon, Vt., on April 14, 1864. At an early age he moved to Ohio and secured his education in the public schools of Akron and Shelby, eventually graduating from Kenyon College at Gambier.

Mr. Fish first became identified with the electrical business when he organized in 1896 the Shelby Electric Company, which owes its great success to his extraordinary ability and determination. At a later date Mr. Fish also became president of the National Electric Lamp Association, the formation of which was greatly due to his efforts.

JOHN CHAMBERLIN FISH.

John Chamberlin Fish was an extremely public-spirited man, and for the past twenty years had exerted a great part of his efforts to the building up of Shelby, Ohio, the city in which he resided. It was due to him that many manufacturing concerns sprang up and flourished therein.

Mr. Fish at the time of his death, aside from being interested in the electrical business, was president of the following companies: Shelby Printing Company, Shelby Water Company, Ohio Seamless Tube Company, and Auto-Call System Company, as well as vice-president of the Shelby Telephone Company, and a director in the Citizens' Bank; all of these being located in Shelby.

Aside from endeavoring to benefit his place of residence in business ways, Mr. Fish also devoted a great deal of his time to the intellectual side, being president of the board of education.

Mr. Fish was a member of the Knights of Pythias and Elk lodges, and was president of the Colonial Club of Shelby and the Shelby Business Men's Association.

Mr. Fish has done more for the people of Shelby, individually and collectively, than anyone else residing within its limits, and in that place his name will live forever.

There are a multitude of people who, through the demise of Mr. Fish, have lost their best friend. He was a broad-minded, thoughtful, democratic, public-spirited man, a man who has caused the world to be better because of his having lived.

The death of Mr. Fish has brought sorrow to a multitude of people, not only in his home town, but throughout this country from coast to coast.

He is survived by a widow and three sons, DeForest R., Cortez Carlisle and John C., and by his mother and one sister, with whom everyone who has met Mr. Fish sympathizes in their affliction.

Army Experiments with Wireless Telephone.

Two sets of wireless telephones are being experimented with by the army at Fort Myer, Va. A communication has been had at a distance of five miles. The officers of the Signal Corps in charge are highly pleased with the results so far, and the army will conduct a long series of experiments looking to the improvement of this line of communication.

An appropriation of $30,000, made in the army appropriation act, has been made available for the purchase of instruments and the continuance of experimental work. In consequence the work will be conducted at Fort Myer on a larger scale, and Signal Corps experts will direct their efforts toward the perfecting of the wireless telephone.

Turbo-Generator Train-Lighting Sets.

All suburban trains of the Burlington out of Chicago are to be lighted with electricity. This is the result of a long test on one train with a system of lighting by means of a turbo-generator, attached to the top of the locomotive boiler between the sand box and the steam dome. Steam is taken from the boiler. The new style of dynamo lights the engine headlight, the cab and nine cars, including four lights on each car platform.

FINANCIAL REPORTS OF ELECTRICAL COMPANIES.

AMERICAN TELEPHONE AND TELEGRAPH.

The income statement of the American Telephone and Telegraph Company for the month of March and three months ended March 31, 1909, compares as follows:

March:	1909.	1908.
Interest and other revenue.	$ 836,429	$ 833,769
Telephone traffic, net	295,482	256,134
Real estate	6,523	4,511
Other sources	99,647	35,728
Total earnings	$1,238,081	$1,130,142
Expenses	237,882	184,976
Net	$1,000,199	$ 945,166
Deductions	666,236	647,640
Balance	$ 333,963	$ 297,526
January 1 to March 31:		
Dividends received	$3,713,106	$3,403,566
Interest and other revenue	2,547,729	2,489,849
Telephone traffic, net	1,014,977	955,964
Real estate	24,075	22,737
Other sources	304,407	153,280
Total earnings	$7,604,296	$7,023,399
Expenses	585,937	526,187
Net	$7,018,358	$6,497,211
Interest	2,221,080	1,928,580
Balance	$4,797,278	$4,568,630
Dividends paid	3,333,064	3,050,560
Balance	$1,464,213	$1,518,070

AMERICAN TELEPHONE ASSOCIATED.

The report of all the associated Bell Telephone operating companies (not including the long-distance lines) of the American Telephone and Telegraph Company for the two months ended February 28 compares as follows:

January 1 to February 28:		
Gross	$21,269,800	$20,080,100
Expenses	15,681,200	14,700,900
Net	$ 5,588,600	$ 5,379,200
Interest	1,184,600	1,299,800
Balance	$ 4,404,000	$ 4,079,400

PHILADELPHIA ELECTRIC.

The Philadelphia Electric Company's report for the year ended December 31, 1908, has been issued. The income account compares as follows:

	1908.	1907.
Gross	$5,244,963	$4,984,350
Exp., taxes and charges	4,285,301	4,075,001
Surplus	$ 959,662	$ 909,349
Dividends	711,068	499,935
Net surplus	$ 248,594	$ 409,414
Previous surplus	2,141,934	1,732,520
Total surplus	$2,390,528	$2,141,934
Stock dividends	*999,510	.....
Profit and loss surplus	$1,391,018	$2,141,934

*A stock dividend, representing instalment on stock, credited to stockholders and charged against surplus.

CANADIAN WESTINGHOUSE COMPANY, LTD.

The annual report of the Canadian Westinghouse Company, Limited, which was submitted to stockholders on March 30, shows net profits for the year 1908 of $320,377 and a total unapportioned surplus of $431,724. The usual dividends of six per cent were paid out of profits.

At the annual meeting of the Canadian Westinghouse Company, held in Hamilton, Ontario, the same day, the retiring directors were re-elected. At the subsequent meeting of the directors the following officers were elected:

President, George Westinghouse; first vice-president, L. A. Osborne; third vice-president and general manager, Paul J. Myler; secretary, John H. Kerr.

MEXICAN TELEPHONE AND TELEGRAPH.

The Mexican Telephone and Telegraph Company has issued a comparative statement of earnings, for twelve months ended February 28, 1909, as follows (Mexican currency):

	1909.	1908.
Gross	$385,767	$388,033
Operating expenses	148,575	153,446
Maintenance	55,756	55,921
Net	$204,331	$209,367
Maintenance	161,020	92,990
Subscribers	6,943	5,975

AMERICAN DISTRICT TELEGRAPH OF NEW JERSEY.

The American District Telegraph Company of New Jersey has issued its final audited statement for the year ended December 31, 1908. The comparative statement follows:

	1908.	1907.
Gross	$3,221,727	$3,017,174
Expenses	2,435,845	2,304,214
Net	$ 785,882	$ 712,960
Dividends	398,088	396,889
Surplus	$ 387,793	$ 316,061

The surplus on December 31, 1907, was $1,244,942, which, added to surplus for the year, $387,794, makes a total profit and loss surplus, December 31, 1908, amounting to $1,632,737.

CHICAGO RAILWAYS.

Passenger receipts of the Chicago Railways Company the past two months increased $234,000, indicating gross earnings of $12,600,000 for the fiscal year ending January 31, 1910, as compared with $11,000,000 last year. The passenger revenue the past two months compares as follows:

	1909.	1908.	1907.
February	$851,834	$742,826	$700,873
March	965,692	840,743	828,906

Rehabilitation work on the North and West Side lines is progressing rapidly. Five car-houses will be completed this year. One at Twenty-fifth and Leavitt streets is practically completed, with a capacity of 142 cars; another at Lincoln and Sheffield avenues, providing for ninety-four cars, will be ready in three months. The so-called limits barn will be rebuilt by September at a cost of $200,000, with accommodations for eighty-six cars and modern repair and cleaning facilities. Two others, at Ogden Avenue and Twenty-second Street and at Kedzie Avenue and Van Buren Street, will be ready by the end of the year. The latter will cost $400,000.

The Board of Supervising Engineers has cut $369,000 from the company's charge against the joint account with the city on the ground that the amounts involved represent legal expenses incurred by the Union Traction receivership.

WASHINGTON RAILWAY.

The Washington Railway and Electric Company, Washington, D. C., has issued its annual report for the year ended December 31, 1908. The income account, including subsidiary companies, compares as follows:

	1908.	1907.
Gross	$3,720,573	$3,385,748
Expenses	1,856,171	1,748,752
Net	$1,864,402	$1,636,996
Other income	37,525	42,353
Total income	$1,901,927	$1,679,349
Charges	1,177,491	1,107,228
Surplus	$ 724,436	$ 572,121

The net income of the whole system for the year ended December 31, 1908, as shown above, was $724,436, of which $108,379 was applied directly by the subsidiary companies without passing through the profit-and-loss account of the Washington Railway and Electric Company, leaving net income $616,057, which equals five per cent on the $8,500,000 preferred stock and 2.94 per cent on the $6,500,000 common stock.

TRI-CITY RAILWAY AND LIGHT.

The Tri-City Railway and Light Company has issued its report for the year ended December 31, 1908. The income account compares as follows:

	1908.	1907.
Gross	$1,819,077	$1,782,356
Expenses and taxes	1,069,316	1,132,392
Net	$ 749,761	$ 649,964
Interest and sinking fund	490,294	398,343
Surplus	$ 259,467	$ 251,621
Dividends	166,347	156,168
Net surplus	$ 93,120	$ 95,453

President Joseph F. Porter says of operations during the fiscal year ended December 31:

"As compared with 1907, gross earnings show an increase of 2.06 per cent, while net earnings, due to improvements, increased efficiency and economies in operation, improved 15.35 per cent. The surplus was sufficient for the full year's dividend of six per cent on the preferred stock, with a balance remaining of $93,119, equal to 1.03 per cent on the $9,000,000 of common stock.

"The severe depression which prevailed during the year in trade in general, materially affecting all branches of industries throughout the country, was, of

course, felt in the Tri-City districts, but the effect there was perhaps not so manifest as in other sections, owing in a measure to the uniform stability of the communities. The increase in net earnings has been accomplished without sacrificing in any way adequate maintenance of the property.

"Until the prospects for a return to normal business conditions could be more accurately gauged, the directors deemed it unwise to proceed with certain improvements which had been in contemplation, considering it more prudent to merely continue the construction work which was absolutely necessary to maintain the properties and to enable it to cope with the necessities of increased business. Such construction work, therefore, was confined to the completion of the electric power plant at Moline, the installation of additional apparatus at the gas plant at Moline, completion of the new heating plant and the necessary expenditures for new business in the gas and electric systems.

"Since writing the above, earnings and business conditions have improved sufficiently to seem to justify a resumption of the improvements spoken of, and work has accordingly been continued."

AMERICAN GAS AND ELECTRIC.

The American Gas and Electric Company reports for March and three months compared as follows:

	1909.	1908.
March:		
Gross (operating companies)	$208,536	$179,050
Net (including A. G. & E.)	61,601	39,172
Interest on bonds	26,175	26,175
Preferred dividends	7,765	6,720
Surplus	27,661	6,277
January 1 to March 31:		
Gross (operating companies)	652,620	550,448
Net (including A. G. & E.)	199,653	136,127
Interest on bonds	78,625	78,625
Preferred dividends	23,161	20,160
Surplus	97,967	37,442

NEW YORK EDISON COMPANY.

According to the report of the New York Edison Company to the Public Service Commission, issued April 15, the company's revenues from sales of electricity in the six months ended December 31 last were $7,231,000, its operating expenses $4,644,000, and its net corporate income, after adding receipts from all other sources and deducting bond interest and other similar expenses, $1,191,000, an amount less than the three per cent dividends of $1,351,000 paid in the same period. The final surplus account equaled $12,849,000.

The company reported increases of more than $1,110,000 in accounts receivable, $2,044,000 in cash, and $5,469,000 in advances from controlling and affiliated companies. Its consumers increased by 6,649 meters by 6,359, and employes by 704 in the six months covered by the report. The Consolidated Gas Company controls the Edison Company by stock ownership.

LONDON UNDERGROUND.

The Underground Electric Railways of London report gross earnings for the week ended March 27 and twelve weeks ended March 27, 1909, compared as follows:

Company:	1909.	1908.
Bakerloo	£ 3,415	£ 3,035
Piccadilly	5,930	5,485
Hampstead	3,855	3,140
District	10,014	8,918
Tramways	5,185	5,386
Total	£ 28,399	£ 26,014
To date, twelve weeks	332,981	308,875

UNITED RAILWAYS OF BALTIMORE.

The income account of the United Railways and Electric Company of Baltimore for the year ended December 31, 1908, compares as follows:

	1908.	1907.
Gross	$6,834,802	$7,018,081
Expenses	3,293,338	3,470,087
Net	$3,541,464	$3,547,994
Other income	3,240	6,505
Total income	$3,544,704	$3,554,499
Charges	2,637,182	2,487,942
Surplus	$ 907,522	$1,066,557
Extra expenses	813,751	1,028,899
Balance	$ 93,771	$ 37,658

Comparing 1908 results with those of 1907, gross earnings decreased $183,279, or 2.61 per cent; operating expenses decreased $176,749, or 5.09 per cent; other income decreased $3,265; fixed charges increased $149,240, or six per cent. The amount carried to profit and loss for the year increased $56,113.

In his annual report President House said, in part: "While the gross revenue shows a decrease, as compared with 1907, the results nevertheless should be gratifying, especially when the universal financial and industrial depression that prevailed throughout the year is considered and the fact that during 1908 there was no special period of extraordinary receipts such as was furnished by the home-coming celebration in 1907."

The increase in fixed charges is due to the additional obligations incurred for rentals on Maryland Electric Railways Company's property, increase in interest on the new funding bonds and increase in taxes. The percentage of operating expenses to gross earnings was 48.18 per cent, as compared with 49.44 per cent in 1907, a decrease of 1.26 per cent.

The stockholders of the United Railways and Electric Company at the annual meeting re-elected the directors.

LONG ISLAND RAILROAD.

At the annual meeting of the Long Island Railroad Company, at which the retiring directors were re-elected, the report for the year ended December 31 was issued showing gross earnings of $9,818,544, a decrease of $311,863 from 1907. Operating expenses were reduced by $1,259,349 to $7,267,235, excluding taxes, which amounted to $393,311, leaving net earnings from operation of $2,157,997. After deducting rentals paid, the net operating earnings were $1,870,374, a gain over the previous year of $811,876.

The addition of earnings from other sources, including rents and interest from investments, brought the gross income to $2,087,242, a gain of $696,675 over the gross earnings of 1907. The payment of fixed rentals on leased roads, interest, etc., left a deficit of $276,088, compared with the deficit for 1907 of $858,828.

The report of President Ralph Peters comments on the extension of electric service from Queens to Hempstead during the year, the results of which, he says, were very satisfactory.

The funds to meet the road's capital requirements were advanced by the Pennsylvania Railroad Company, and in this connection it is stated that about $6,000,000 has been advanced by the Pennsylvania for additions and improvements in addition to the $22,000,000 expended for these purposes from the proceeds of the bonds sold.

AMERICAN LIGHT AND TRACTION.

The American Light and Traction Company's report for the quarter ended March 31, 1909, compares as follows:

	1909.	1908.
Earnings on stocks of subsidiary companies owned by this company	$775,549	$600,463
Miscellaneous earnings	72,482	58,630
Gross earnings	$848,032	$659,093
Expenses	26,023	12,000
Net earnings	$822,009	$647,093
Dividends accrued:		
On preferred stock	213,543	213,543
On common stock	160,039	101,410
Total dividends	$373,582	$314,953
Surplus for quarter	448,426	332,140
Reconstruction reserve	176,500	176,499
Net surplus	$271,926	$155,640

The surplus and earnings accounts for the last twelve months shows:

Surplus account, March 31, 1908		$3,148,467
Net earnings twelve months, ending March 31, 1909	$2,852,979	
Dividends:		
On preferred stock	$854,171	
On common stock	553,712	
Total dividends	1,407,883	
Surplus earnings for twelve months	$1,445,095	
Less amount carried to reconstruction reserve	681,000	
Net gain in surplus acct.		764,095
Total net surplus, March 31, 1909		$3,912,563

REVIEWS OF CURRENT ENGINEERING AND SCIENTIFIC LITERATURE

THE DESIGN OF INTAKES FOR HYDRO-ELECTRIC PLANTS.

This is the subject of an article by J. B. Balcomb. The author deprecates the rule-of-thumb methods so often employed and offers a treatment used by him in his own practice. He takes an actual case and assuming a length of intake determined by practical considerations divides this up into a number of equal sections to be calculated separately. By the aid of some simple mathematics, the elementary principles of hydraulics, and the use of Kutter's formula, the author proceeds to establish his result. In conclusion, while advocating mathematical computation to a predetermined degree of accuracy, Mr. Balcomb mentions some practical considerations which occasion the seasoning of mathematically obtained results with a wise admixture of "common sense."—*Abstracted from Engineering News (New York), April 8.*

ELECTRICALLY OPERATED CENTRIFUGAL PUMPS IN BELGIUM.

The author asserts that the multi-stage centrifugal type is the best form of electrically operated pump for high-pressure service in mines. Various types of electrically operated pumps are described and illustrated, both for direct and for alternating currents. One of the examples is a 135-horsepower electric pump at Schlaigneau. The combined efficiency of motor and pump is 67.5 per cent, and from 135 to 140 cubic metres of water are raised per hour to a height of 180 to 190 metres. The dimensions of the motor and pump combined are four by 1.2 by 1.8 metres. This electric pump was installed to replace two steam pumps of fifty and sixty cubic metres per hour capacity, respectively. Great economy of space is effected by the change, as each of the steam pumps required an underground chamber 3.5 metres wide by 6.5 metres long.—*Abstracted from Mining Science,' April 8.*

THE BELIN TELESTEREOGRAPH.

The principle of this apparatus for transmitting photographs to a distance is briefly as follows: At the transmitting station a gelatine negative with hollows and reliefs is rolled on a cylinder; a stylo bearing on the negative displaces a small wheel over the twenty contacts of a rheostat, which is traversed by the line current. At the receiving station a Blondel oscillograph sends a luminous ray through a transparent screen with twenty graduated shades. After leaving the screen the ray passes through a lens and is projected on a slot, behind which a sheet of sensitive paper mounted on a cylinder is being moved. The hollows and reliefs of the transmitting negative are thus reproduced on the developed sensitive paper as more or less dark spots, and as the hollows and reliefs correspond to the different shades of the image from which the transmitting negative is prepared the picture is reproduced at a distance if the cylinders rotate in synchronism. Experiments have recently been made between Paris and Lyon and a photograph ten by fourteen centimetres in size was transmitted in five minutes and twenty seconds.—*Translated and abstracted from La Revue Electrique (Paris), March 30.*

A NEW METHOD OF FUSING COPPER LEADING-IN WIRES INTO INCANDESCENT LAMPS.

Many attempts have been made to utilize copper and other cheap metals and alloys for leading-in-wires of incandescent lamps in place of platinum, but without satisfactory results. Recent experiments of Bastian and Carvert of London have shown that copper can be used for this purpose, if those parts of the copper electrodes to be fused into the glass are specially prepared: These investigators consider it absolutely necessary that the copper conductor be flattened at the point where it is fused into the glass and that it have the smallest cross-section consistent with the required conductivity and mechanical strength and at the same time the largest practicable surface. The thickness of the flattened part of the conductor must not be more than 0.1 millimetre. It is, further, of particular importance that the conductor be provided with a coating of a suitable glass flux at the flattened place before it is fused into the lamp. This glass flux must be applied to the thin flat copper strip and oxidation of the copper must be prevented. To do this it is said to be best to use a flat glass tube which fits tightly over the conductor and consists of a soft glass flux, the so-called platinum glass, for instance, so that it can be fused on the copper conductor before the latter is molten or oxidized. While fusing the tube onto the conductor both ends of the latter are held in clamping devices. The coating must be applied very quickly and uniformly. Care must be taken that the surface of the conductor is clean and especially free of fatty substances, and that during the coating process the conductor be kept as cool as possible in order to prevent the cracking of the glass.—*Translated and abstracted from Elektrotechnischer Anzeiger (Berlin), March 21.*

PRINCIPLES FOR THE CONSTRUCTION OF WIRELESS TELEGRAPH SYSTEMS.

"It appears worth while to consider in how far the present wireless-telegraph arrangements represent those ideal conditions that promise the most favorable effects, and to ascertain which constructions are of lasting value and in which direction we shall have to work with the greatest prospect of success in order to further perfect the systems," says Dr. F. Kiebitz, in a lecture delivered before the Elektrotechnische Verein in Berlin, which is here reprinted. His general conclusions are, that the modern methods of high-frequency current generation possess so high a degree of efficiency, that no fundamental progress in wireless telegraphy can be expected from an increase of this efficiency. On the other hand, there is a possibility of improving the effectiveness of stations considerably by approaching the conditions of the aerial circuit to the conditions calculated by Drude. By the employment of several antennæ, directed wireless telegraphy may be attained without diminishing the distance of transmission. This may be done by compensating the counterweight by a second antenna erected at some distance from the first. The effects of both antennæ will then be eliminated by interference in the direction in which they appear alongside of each other. This system has been worked out in small field stations, with good results. As regards the receiver, it is practicable to couple a very aperiodic de-

tector circuit magnetically with the aerial circuit.—*Translated and abstracted from Elektrotechnische Zeitschrift (Berlin), March 11.*

A NEW ALUMINUM ALLOY.

The softness and other unfavorable properties of aluminum have prevented its extensive employment in many arts and industries, in which its unquestionable qualities would cause it to be adopted. Efforts have been made to remove this defect by combining it with small proportions of other metals. An attempt of this sort has been made in Berlin by forming a new aluminum alloy, which is called magnalium, by combining ninety to ninety-eight per cent of aluminum with magnesium. It is claimed that this alloy has all the qualities of aluminum with a notable increase in hardness, tensile strength, etc., so that it may be generally employed in the industries. Magnalium, like aluminum, can be easily smelted; it can be easily worked and will assume the polish of a mirror. It can also be drawn into wires and rolled into sheets without soiling the tools, like aluminum. Certain precautions are necessary in the treatment of magnalium. Graphite crucibles are best for smelting it, and it must not be heated above 650 degrees centigrade, its fusing point, as above this temperature the metal will change. The crucible must be placed on a refractory support, to avoid its direct contact with the grate, so that the relatively cold-air current passing after the combustion of the coke cannot strike it. In spite of the rather low fusion point, the crucible must remain on the fire for three-quarters of an hour. Casting the metal in molds cooled by water jets will give it a tensile strength of twelve to fifteen kilogrammes per square millimetre under a reduction of the section at the breaking point by five-eighths. The following table gives the chief characteristics of this alloy, as compared with other metals:

Metals.	Specific Weight.	Tensile Strength.	Reduction of Breaking Section, Per Cent.	Tensile Strength Divided by Specific Weight.
	Kg.	Kg.		Kg.
Magnalium, rolled....	2.51	36.9	3.7	14.7
Magnalium, tempered.	2.49	29	17.8	11.6
Magnalium, cast.....	2.50	12.1-15.2	3.75	4.8-6
Aluminum, rolled....	2.7	27.3	4.1	10
Aluminum, cast.....	2.7	7.4	1.175	2.75
Siemens-Martin steel with 2 per cent aluminum	7.9	80.1	12.5	10.1
Tempered steel.....	7.7	59.5	12.15	7.6
Iron	7	35.4	15	5
Cast iron.....	7	12.6	0.5	1.8
Copper	8.8	22.2	42	4

Magnalium has a very fine grain and can, therefore, be easily polished; it can be turned with twice as great machine-tool speed as aluminum, and it resists oxidation better than any other metal or alloy of small density. It is non-magnetic, and its thermal and electrical conductivity are about fifty-six per cent that of pure copper.—*Translated and abstracted from L'Electricien (Paris), March 20.*

FLYWHEEL DYNAMO OF 2,500 KILOWATTS.

The method of giving to the rotor of a dynamo all the weight necessary for a flywheel is quite general with alternators run by slow-speed prime movers, but the Felten & Guilleume-Lahmeyer Company seems to be the only one that also applies this construction to direct-current machines. In order to make the armature as light as possible and still give it sufficient momentum of inertia, it must be of large diameter. On the other hand, as the length of the armature is inversely proportional to the square of its diameter, it is always very short, and therefore the flywheel dynamo occupies little space in the axial direction. A 2,500-kilowatt, direct-current dynamo of this type has recently been installed by the above concern in the Singer Company's power station in Glasgow. It runs at a speed of eighty-five revolutions and feeds motors and lamps at a tension of 250 volts. The stationary field consists of a strong cast-iron frame seven metres in diameter on the outside and seventy-five centimetres wide. An inside ring reduced to a width of 610 millimetres serves as the magnetic yoke proper and carries twenty-four cast-steel poles of an oval section of 855 square centimetres, and an equal number of commutating poles between them. The pole projections are laminated and have a rectangular cross-section of 240 by 485 centimetres. The principal poles are connected in series and excited in shunt. The outside frame has numerous ventilating holes. The armature, which has an outside diameter of 530 centimetres, is separated from the pole-pieces by an air-gap of about eight millimetres. Its core is formed by three sets of thin iron sheets separated by two ventilating channels, and the core is fastened by means of bolts between two cast-iron wheels, which have been given all the weight necessary, so that the rotor weighs approximately fifty-six tons. The rim of these wheels has open slots for receiving the armature winding, which consist of copper bars. Their open ends are soldered to wires connected with the commutator, which is 250 centimetres in diameter and 425 millimetres wide, and has 780 segments of hard copper insulated by micanite. The current is collected by twenty-four rows of twelve carbon brushes each. The efficiency of the dynamo at full load is ninety-five per cent. The resistance of the armature when warm is 0.000565 ohm. The machine heats very little; after ten hours running under load the temperature of the armature rises only twenty-seven degrees on the average, and that of the field fourteen to seventeen degrees.—*Translated and abstracted from La Lumiere Electrique (Paris), March 20.*

Some Humor from the German.

The carnival number of the *Münchener Neueste Nachrichten,* published at Munich, Germany, and devoted entirely to humorous nonsense, contains the following advertisement:

Obacht! Obacht!
Der leichte kleine Edison-Akkumulator
der nicht grösser ist als ein Mainzer Handkäschen
und dabei Hunderttausend Volts und fünfzig Doppelzentner Watt pro Minute aufzuspeichern imstande ist,
bequem in der Westentasche zu tragen,
von mir seit zehn Jahren bestimmt versprochen,
ist nun
endlich
erfunden!
Vor minderwertigen Nachahmungen wird gewarnt.
allein echt mit der Marke
Alva Beta Edison.

A HUMOROUS GERMAN "AD."

A liberal translation of this quaint "ad" is given below:

Attention! Attention!

The light small Edison Accumulator,

which is not bigger than a small dairy cheese and in which, nevertheless, hundred thousand volts and fifty tons of watts per minute can be stored.

May be carried in the vestpocket.

Promised by me for a certainty for the last ten years is

a(t) las(t)

difficult to construct and therefore not yet

INVENTED!

Beware of worthless imitations.

If it is at last constructed, and by me, it will be

GENUINE ONLY WITH THE TRADEMARK

ALVA BETA EDISON.

It will be noticed that the fun is directed not only at Edison but more particularly at the German manufacturer (Bergmann), who is continually promising to bring forth the genuine Edison storage battery.

INDUSTRIAL SECTION

ILLUSTRATED DESCRIPTIONS OF NEW AND STANDARD ELECTRICAL AND MECHANICAL APPARATUS

A SOLUTION OF THE COUNTERBALANCING PROBLEM IN STATIONARY STEAM-ENGINE DESIGN.

BY F. H. BALL.

The tendency of modern engine design is toward higher speed, especially for engines which must be installed in close quarters, as in office buildings, hotels, factories, etc. Frequently the question as to whether a building should supply its own light and power and utilize the exhaust steam for heating, or whether it should buy current and also spend nearly as much as before for coal for live steam heating finally resolves itself into the possibility of getting all the machinery required into the limited space available in the basement. Where engines are installed in buildings of this character it is also essential that they be balanced as perfectly as possible in order that vibrations or tremors may not be communicated to upper floors and to adjoining buildings.

The question of engine balancing has received close and exhaustive study during recent years, especially in its relation to marine engines and locomotives, although it is surprising in this connection that the case which offers the easiest solution has been the last to be attacked, namely, that of the stationary engine. This article is devoted to a general discussion of the problem of balancing and to a description of an engine in which an almost perfect balance has been achieved by exceptionally simple means.

The effect of a counterbalance attached to the heel of a crank opposite the crank pin and its limitations are subjects not generally understood. For instance, many suppose that an engine may be perfectly counterbalanced at one speed and not so at another, which is not true.

It is well known that the centrifugal force of a counterweight acts diametrically opposite the crank pin, and when the crank pin is passing either of the dead centres the counterweight opposes or neutralizes the unbalanced force due to the starting and stopping of the reciprocating parts, usually the piston, piston rod, crosshead and connecting rod.

If there were nothing else to be considered except the counterbalancing of the reciprocating parts at the centre, where the greatest need of counterbalance is felt, the problem would be a very simple one, for it would only be necessary to determine how much counterweight would exactly neutralize the unbalanced force at the centres and the engine would be

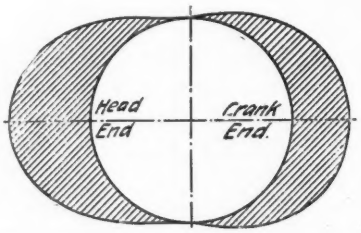


FIG. 1.—INERTIA FORCE DIAGRAM OF SIMPLE HORIZONTAL ENGINE WITHOUT COUNTERBALANCE.

perfectly balanced. Unfortunately, the problem is a more complicated one.

Because of the obliquity of the connecting rod, the acceleration of the reciprocating parts is much greater at one centre than at the other; therefore, a counterweight that exactly neutralizes the

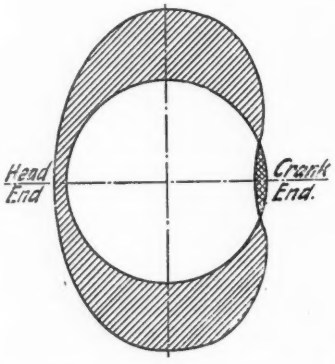


FIG. 2.—INERTIA FORCE DIAGRAM OF SIMPLE HORIZONTAL ENGINE WITH COUNTERBALANCE.

unbalanced force at one centre is either too heavy or too light at the other centre. The effect of a connecting rod of the usual length is to increase the force at one centre about one-sixth and reduce the force at the other centre about the same amount, thereby making a difference of about one-third between the smaller and the larger force. This is inevitable and it is plainly impossible to have a perfect counterbalance, even on the line of centres, unless a connecting rod of infinite length is used. This is not all, for the counterweight exerts its full force radially throughout the revolution, and when, in a horizontal engine, the counterweight is in a position above or below the shaft there are no reciprocating parts developing an equivalent force in the opposite direction, and therefore the centrifugal force of the counterweight causes a violent unbalanced up or down force.

This is illustrated by the fact which has been established by experiment, that the counterweight on the driving wheel of locomotives actually causes the wheels to lift from the rails at every revolution when the speed is very high. A clear idea of these forces may be had by investigating, for instance, the counterbalancing of a 16 by 14 simple American-

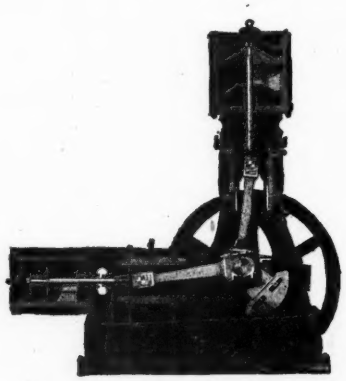


FIG. 3.—AMERICAN-BALL ANGLE-COMPOUND ENGINE; VERTICAL SECTION.

Ball engine rated at 160 horsepower and running at 250 revolutions per minute.

The reciprocating parts of this engine, consisting of the piston and rod, the crosshead and the connecting rod, weigh about 550 pounds. These parts, because of their inertia, develop an unbalanced thrust when the crank is passing a dead centre of about 6,900 pounds, which is equal to the centrifugal force of a mass of 550 pounds revolving on the shaft and having its centre of gravity seven inches from the centre of the shaft.

Fig. 1 would represent the inertia force diagram of the reciprocating parts of this engine if there were no counterbalance used. The length of that part of a radial line lying within the shaded

area would represent the unbalanced force at every instant of a complete revolution. It will be seen that the greatest unbalanced force would be on the line of centres. The modifying effect of a connecting rod is also apparent in the difference between the maximum forces at the two centres. It will be noticed that near mid-strokes there is no unbalanced force because the reciprocating parts have at these points their maximum velocity.

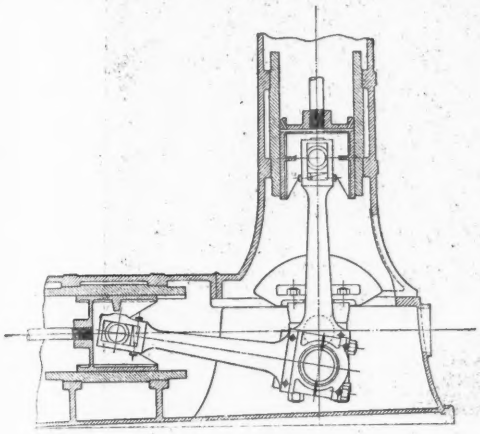


FIG. 4.—ANGLE-COMPOUND ENGINE; PART VERTICAL SECTION SHOWING CRANK OF VERTICAL ELEMENT ON DEAD CENTER.

A counterbalance of 550 pounds attached to the heel of the crank, with its centre of gravity seven inches from the centre of the shaft and directly opposite the crank pin, would neutralize the inertia thrust of the reciprocating parts when passing the line of centres. Fig. 2 repre-

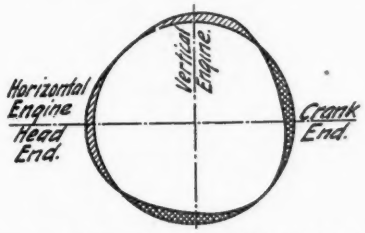


FIG. 5.—INERTIA FORCE DIAGRAM OF ANGLE-COMPOUND ENGINE WITH COUNTERBALANCE.

sents the inertia forces under these conditions. It will be noticed that the effect of the counterweight is to transfer the maximum unbalanced force into a vertical direction without any diminution in magnitude whatever, so that the maximum forces are not neutralized but are merely transferred from horizontal to vertical. It will also be noticed that because of the modification due to connecting-rod obliquity a small unbalanced force is still felt on the line of horizontal centres, but instead of being a reciprocating force it is directed toward the cylinders at both centres.

While this constitutes good counterbalance at the point of otherwise maximum unbalanced thrust in a single horizontal engine and while it would eliminate any tendency to shake horizontally on the foundations, it is very apparent that if there were nothing to neutralize this thrust of about three-and-one-half tons the engine and foundation would tend to hop up and down 250 times per minute, thereby causing additional friction at the shaft bearings and much unnecessary strain.

A very practical method of correcting this fault of a reciprocating engine is to combine two engines on the same crank pin, having the high-pressure and low-pressure elements at right angles to each other in the plane of the crank's rotation, as in the American-Ball angle-compound engine (Fig. 3), for in this way the fault of each engine is made to neutralize the same fault in the other.

Fig. 4, a partial cross-section of the angle-compound engine, illustrates this arrangement. The horizontal engine is arranged to be perfectly counterbalanced on its line of centres, but as has been explained, is badly out of balance in a vertical plane. The vertical engine is balanced in its vertical line of centres, but if considered apart from the horizontal engine is badly out of balance horizontally. The relation of these engines to each other is such that the same counterbalance serves perfectly for both engines. The crank in Fig. 4 is shown in the same position as in Fig. 1, and the heavy vertical thrust due to the centrifugal force of the counterweight is neutralized by the inertia of the vertical reciprocating parts. The same balancing occurs again when the crank has advanced through an angle of ninety degrees to the line of horizontal centres, only in this case the horizontal engine instead of the vertical is balanced by the counterweight, so that at four points in each revolution the counterbalancing is perfect, and between these points the overlapping of the forces of the two reciprocating parts maintains a more or less approximate balance. Fig. 5 is a diagram of the unbalanced inertia forces in such an engine. The slight unbalanced forces are due to the effect of the connecting rods, already explained, but they are unimportant and easily absorbed by the mass of the engine.

Incidentally, the angle-compound engine effects a great saving of floor space; in fact it occupies only about as much floor space as a simple engine of half the power, and gives a steam economy about equal to that of a good tandem or cross-compound.

Another point worthy of mention is that the more equable turning moment of this type of engine considerably reduces the weight of flywheel required for a given coefficient of fluctuation of speed of the engine.

There are other practical advantages in this. The maximum stresses for a given horsepower capacity are reduced. The more equal turning moment is also desirable where such machinery as looms, spinning machinery, etc., is driven directly by a belt or a rope-drive, while in the case of electrical machinery it is beneficial with alternators, especially when they are driven in parallel, reducing the amount of power-wasting and otherwise useless cross-current required to keep the alternators in step. With an engine having an uneven turning moment it is impossible to eliminate this cross current unless the two generating units fall into step exactly in the same phase of the revolution.

Phonograph Suits Settled.

Mr. Edison has settled for $450,000 the suit for breach of contract brought against him by the New York Phonograph Company. In addition, his counsel has signed agreements to settle approximately 700 suits brought by the New York company against dealers in that state. The amount involved in the settlement of these and the principal suit is approximately $2,000,000.

The suit was for the territorial rights for the sale of Edison phonographs and phonographic supplies in New York state. It was begun in 1901. A similar suit for territorial rights to the New England states is now pending in the courts.

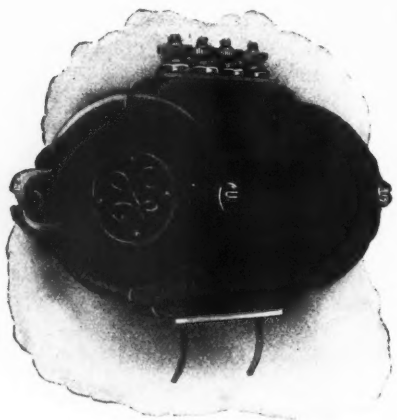
The President's Wife Purchases an Electric Automobile.

The Baker Motor Vehicle Company, Cleveland, Ohio, has recently received an order through its Washington agents for a Queen Victoria electric automobile for immediate shipment to Mrs. Taft, wife of the President of the United States. The car, which Mrs. Taft proposes to drive herself, will be the finest ever built by the Baker company. It will be handsomely finished in blue broadcloth and the coat of arms of the United States will be emblazoned on the panels of the doors.

A New Bell-Ringing Transformer.

The electric bell and its heretofore indispensable ally, the primary battery, date back to the early days of the electrical industry. The same can be said of the alternating-current transformer. But the combination of the transformer and the electric bell is of modern origin and the direct result of a desire to get rid of the troublesome and trying situations arising from the use of primary or storage batteries.

To meet this demand, the General Electric Company, Schenectady, N. Y., has recently placed on the market a transformer for ringing electric bells. This transformer has a low-voltage secondary winding with taps giving six, twelve, and eighteen volts, when the primary is connected to the ordinary 110-volt lighting circuit. The transformer will operate successfully on circuits ranging from 100 to 130 volts at the usual lighting frequencies.



BELL-RINGING TRANSFORMER.

The entire transformer is so small that it may be held in the hand. The general design has been proportioned for very low losses, the core loss being practically negligible. The transformer is designed in such a manner that a continuous short-circuit on the secondary will do no damage either to the transformer or adjacent circuits.

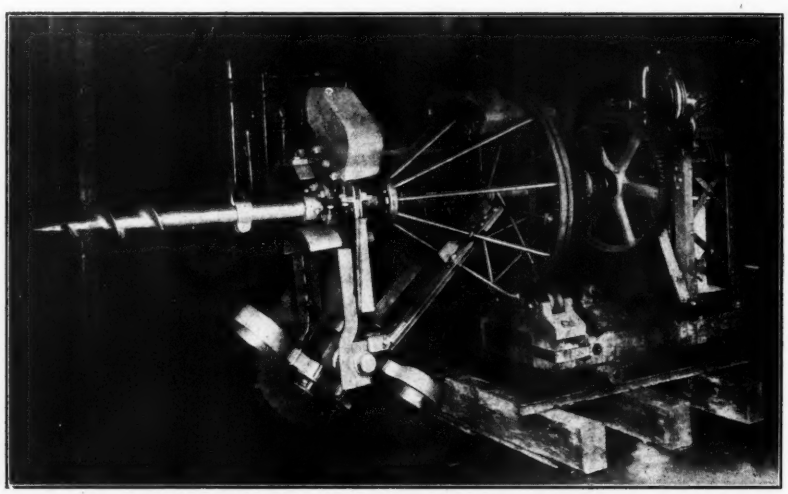
The core and coils are placed in a small metal box with lugs or feet attached for convenience in fastening to the wall or ceiling. A screw-driver is the only tool needed for installing the transformer, after which it requires no attention whatever.

This transformer may also be used to advantage for operating buzzers, spark-coils, burglar alarms, miniature lamps, door locks, gas-lighting and annunciator systems.

An Electrically Driven Tunneling Machine.

The device illustrated herewith is an electrically driven tunneling machine, invented by Willis F. Brown, of Detroit, a well-known civil engineer.

The machine is driven by a compound-wound electric motor of seven-and-one-half horsepower. The weight of the complete device is only two-and-one-half tons.



ELECTRICALLY DRIVEN TUNNELING MACHINE.

The machine is designed for clay-cutting and is adjustable to any soil. Its capacity is about ten feet advance per hour in an eight-foot drift, and it may be mounted on an ordinary truck car or be attached to the interior of a shield. When mounted on a truck the machine is easily adjusted to line and grade, also to bores from six feet up to any diameter. This also holds good when the machine is fixed in a shield, except that the alignment is kept by the shield.

The action is automatic, the clay being cut from the breast by a combined transverse and longitudinal revolution of the knives. The transverse motion is controlled according to the section to be taken out. The excavated material is picked up from the floor by an ingenious mechanical arrangement and is carried by belt conveyor to the rear, where it is deposited in a receptacle for removal.

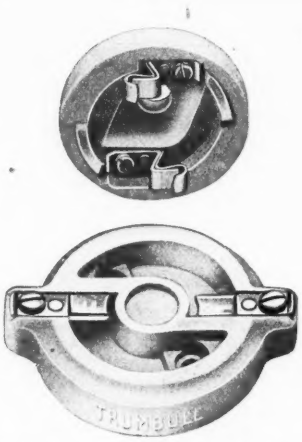
The machine is the result of several years of study and actual contact with tunneling methods. Its simplicity and positive action are highly indorsed by engineers and contractors.

It is announced that next July Mexican mining men will form a Mexican metallurgical and mining institute on the lines of the American Institute of Mining Engineers.

New Trumbull Two-Piece Rosettes.

The Trumbull Electric Manufacturing Company, Plainville, Conn., has placed on the market a complete new line of two-piece rosettes—fusible and fuseless—of the cleat, concealed and molding types. The caps are interchangeable.

In designing this new line, the Trumbull company had in mind the chief difficulty found in rosettes, of the cap loosening or jarring off from the base. Before marketing them, these rosettes were put through various and severe tests, which showed that their construction had eliminated this difficulty, and the makers state that the caps cannot jar loose from the base.



TRUMBULL TWO-PIECE ROSETTES.

This result is attained, in addition to using great care in assembling, by the use of a strong bronze spring, which follows the contact in the base and holds the caps securely at all times. The contact pieces are struck off at an angle in such a way that when strain is put on they are drawn more tightly together.

Argentina's Requirements in Products of the Electrical Industry.

Reports have recently arrived from Argentina on its foreign commerce during 1907 which show again that Germany supplies by far the greatest part of the electrical products for this market. Argentina imported products of the electrical industry as follows:

	Average, 1901-04	During 1905.	During 1906.	During 1907.
	1,000 Pesos Gold (1 peso = $1.)			
Total	1,015	2,035	3,430	3,373
From—				
Germany	410	1,126	1,629	1,832
England	288	466	1,125	850
United States	150	175	416	266
Italy	62	137	74	109
France	28	75	82	84
Belgium	53	31	112	88

Germany's share in the imports into Argentina during the years 1901 to 1904 amounted on the average to forty-one per cent; in 1905 to fifty-six per cent; in 1906 to forty-seven per cent, and in 1907 to fifty-four per cent. Thus it may be said that about one-half of the electrical products imported into Argentina originate in Germany. The corresponding figures for England are twenty-eight per cent, twenty-three per cent, thirty-three per cent and twenty-five per cent. Great Britain therefore contributes about one-quarter to the supply of the Argentina market, while the other competitors remain far behind these two countries.

New Fire-Alarm System for New York City.

Former Corporation Counsel Delany appeared before the New York city Board of Estimate on April 16 for the United Electric Service Company in its application for a franchise to construct and use an electric-signal system under the streets of the city for calling messengers and operating burglar and fire alarms.

At Comptroller Metz's suggestion, the application was approved, with instructions to the corporation counsel to insert in the form of contract a clause prohibiting the United Electric Service Company from installing telephone service.

Edison Company Gets Boston Lighting Contract.

The Edison Electric Illuminating Company has been awarded a new five-year contract for street lighting in Boston, Mass., at a remuneration of $380,000 a year, with the proviso that the city may extend this to ten years at the reduced price of $360,000 a year. The scientific heads of Harvard and the Boston School of Technology, together with a third person to be chosen by these gentlemen, will act as a board of arbitration.

Centennial Anniversary of the Argentine Republic—International Exhibition of Railways and Land Transport.

A great international exhibition of railways and land transport will be held at Buenos Aires from May 25 to November 25, 1910, to commemorate the one-hundredth anniversary of the foundation of the Argentine Republic.

The executive committee in charge of arrangements has issued circulars giving minute details as to the procedure and arrangement of the exhibition. A. Schneidewind, C. E., general director of the Argentine railroads, is the president, and Ed. Schlatter, C. E., the secretary.

The official programme divides the exhiibtion into the following sections:

1. Railways and tramways moved by other than electric power.
2. Electric railways and tramways.
3. Automobilism.
4. Cycling.
5. Post offices, telegraph, telephone and other means of communication.
6. Beasts of burden, horsemen and vehicles for teams.
7. Ordinary public roads, bridle roads, highroads, suburban streets and sporting tracks.
8. Military transports and sanitary service in the transportation of sick and wounded.
9. Baggages, packing, etc.
10. Municipal transports and vehicles; apparatus, etc., pertaining to fire-extinguishing service.
11. Decorative fine arts applied to the transport industry.
12. Hygiene and sanitary assistance in land transports.
13. Providence, assistance, and patronage in favor of workmen, employes, agents, clerks, etc., in the service of transport companies.
14. Mechanical industries applied to transports.
15. Special national works.
16. Aeronautics.

Intending exhibitors should note that application for permission to exhibit in special enclosures, or for foundations, special buildings, the use of power, etc., necessary for engines, heavy machinery, or the like, must be made not later than June 15, 1909.

Goods will be admitted to the exhibition from April 1 to May 5, 1910. Heavy or bulky packages, such as engines, appliances requiring special foundations or erecting, must be consigned not later than February 28, 1910.

The Boston Herald Erects Wireless Telegraph Installation.

The Boston (Mass.) *Herald* has installed during the past week a private wireless telegraph on its buildings at Tremont and Mason streets.

The four-wire aerial is 222 feet long, 143 feet above the ground at one end and ninety-seven feet high at the other.

Near the Mason Street end of the aerial the four wires are tapped and connected with the rest of the apparatus in a special room, but a few steps from the news editors.

A three-circuit type of receiver is used. This will enable the operator to cut out any undesirable message and will afford the greatest possible immunity from interference.

Suppression of interference is also furthered by an adjustable coupling on the receiver. The coupling can be made loose between the primary or open circuit and the secondary, or weeding-out, circuit, as well as between the weeding-out circuit and the tertiary circuit. The induction of each circuit will be separately adjustable for tuning purposes, and the operator will be able to change the electrical stiffness of each circuit separately.

The detector is of the Wollaston electrode type and is furnished with an adjustable potentiometer.

The telephone receiver is of the watch-case type, with head-bands attached, wound with copper wire to a resistance of 1,500 ohms.

The installation was carried out by the Stone Telephone and Telegraph Company of Cambridge, Mass.

Electromagnetic Induction Possibly a Cause of the Zeppelin Disaster.

In the March issue of *Aeronautics*, C. W. Sirch suggests that the possible cause of the disaster to the first Zeppelin dirigible was an inductive effect generated by a lightning stroke. He states that the aluminum framework of the Zeppelin craft contained many circular paths capable of generating such an induced current during the storm. While the loops were riveted, it is well known, says Mr. Sirch, that the oxide which forms on the surface of aluminum insulates the metal against electrical currents of low potential. A high-potential discharge, however, would jump across this insulation, and as this framework was always surrounded by free hydrogen, it is very probable that the explosion may be traceable to this phenomenon.

New York Law Amendments Strengthen Utility Boards.

Changes in the proposed amendments to the Public Service Commission's (New York) law have been announced by Chairman J. S. Parker of the Assembly Committee on Railroads.

The commissions may authorize commutation, school commutation, or interchangeable mileage over railroads and street railways except for a continuous ride wholly within other than first-class cities. The commissions also may fix through freight and passenger rates, except that no through rate can be insisted upon between a street railway and a steam railway.

In addition to the four purposes for which stocks or bonds may now be issued the bill provides that, with approval of the commissions, such securities may be issued for reimbursing of moneys actually expended for permanent purposes.

Public Health Conference at the University of Illinois.

The president of the University of Illinois, Dr. Edmund J. James, and the president of the Illinois State Board of Health, Dr. Geo. W. Webster, have united in the issuing of a call for a public health conference at the State University of Illinois on Friday, April 23, at 2 p. m. The purpose of this conference is to discuss questions connected with the organization and administration of public health. The chemical, biological, engineering, water and sanitary laboratories of the university will be open for inspection and will be placed at the service of the conference. Professor Sedgwick, of the Massachusetts Institute of Technology, will deliver a course of six lectures during the week upon science in the service of public health.

Magnetic Club of Philadelphia.

At the annual meeting of the Magnetic Club of Philadelphia, held recently, the following officers were elected for the ensuing year: President, F. J. McLaughlin; vice-president, J. D. Israel; secretary, C. B. Wood; treasurer, H. W. Hetzel. Governing committee—To serve two years: Washington Devereux, S. S. Garwood, J. W. Meyer, F. E. Maize, C. A. Stimpson, A. S. Weir, G. J. Wells. To serve one year: J. D. Israel, W. S. Burleigh, E. C. Boileau, J. W. Kelly, C. C. Ingalls, A. H. Manwaring, A. G. Wallace.

It was decided to hold the next banquet in the fall.

An Exceptional Issue of Patents.

On Tuesday, April 6, there were granted by the United States Patent Office at Washington, D. C., a total of 784 patents, which, from the records at hand, is the largest number as yet issued in any one week. Of this number the patents that may be classed as electrical aggregated 100, or 12.75 per cent, both of which are exceptionally large figures. Of the electrical patents thirty-one were assigned to the General Electric Company by twenty-nine different inventors. Five non-electrical patents were also assigned to this company. This makes a total of thirty-six patents assigned to one company by thirty-four different assignors out of a single week's issue and is a striking evidence of the strength of that company in new development work.

Charging Rates for Electric Vehicles in Washington, D. C.

The Potomac Electric Power Company, Washington, D. C., has informed us in a recent communication that it charges the following rates for current to the owners and operators of garages: For the first 1,000 kilowatt-hours per month, six cents per kilowatt-hour; for the next 500, five cents per kilowatt-hour; for the next 500, four cents per kilowatt-hour; and for all over 2,000 kilowatt-hours per month, three cents per kilowatt-hour.

New Glidden Tour Date.

Announcement was made April 15 by the American Automobile Association that the annual Glidden reliability tour will start on July 12 instead of July 5, as originally scheduled. Detroit, the starting place of the tour, purposes to celebrate Independence Day on July 5 this year. The wisdom of moving along the beginning of the Glidden run one week appealed to the American Automobile Association contest board.

The Hudson-Fulton Celebration.

In his report to Controller Metz, of New York, Charles S. Hervey, Chief Statistician of the Department of Finance, sets forth the manner of spending the million dollars or so appropriated by the committee in charge of the Hudson-Fulton Celebration.

Interesting items are: $100,000 for illumination; $10,000 for a replica of the Clermont; and $1,000 each for two gold medals for King Edward of Great Britain and Queen Wilhelmina of Holland.

Waterpowers of Sweden and Norway.

According to recent careful investigations and calculations the waterpowers that can be commercially developed in Sweden aggregate about 4,000,000 horsepower, and in Norway about 5,000,000 horsepower is similarly available. In each country about ten per cent of the aggregate total will have been utilized when the hydroelectric plants now being built are completed. Owing to the great variety of natural conditions prevalent in each country the power plants are of many different types, utilizing heads from less than three feet up to 3,290 feet and dealing with quantities of water up to 9,900 cubic feet per second.

Wireless Telephone System in Use.

The commercial wireless-telephone system was opened to the general public at Portland, Me., April 16. Four out of thirty stations which will connect Portland with the islands of Casco Bay are in commission.

The first message was one of congratulation from Mayor Clifford at Portland to A. Frederick Collins, who installed the system.

Missouri Electric, Gas, Street Railway and Waterworks Association.

At the annual meeting of the Missouri Electric Light, Gas and Street Railway Association, held at Springfield, April 15-17, the name of the association was changed to "Missouri Electric, Gas, Street Railway and Waterworks Association." Officers were elected as follows:

W. A. Bixby, Springfield, Mo., president.

R. J. Irvine, Marshall, Mo., first vice-president.

F. E. Murray, Louisiana, Mo., second vice-president.

P. A. Bertrand, Jefferson City, Mo., third vice-president.

C. L. Clary, Sikeston, Mo., secretary and treasurer.

Executive committee—H. B. Hibbler, Washington, Mo.; Paul J. M. Loewe, Moberly, Mo.; C. W. Hough, Joplin, Mo.; S. E. Bronson, Ozark, Mo.

The next annual meeting will be held at Jefferson City, Mo., April 14-16, 1910.

American Association of Electric Motor Manufacturers.

The annual meeting of the American Association of Electric Motor Manufacturers will be held at Hot Springs, Va., on May 24, 25, 26, 27, instead of May 17-20, as previously announced.

Current Electrical News

GREAT BRITAIN.

(Special Correspondence.)

LONDON, APRIL 10.—The General Manager of the Liverpool Corporation Tramways has invented an ingenious arrangement whereby the driver of a car is aware when a passenger is on the step, thus enabling him to avoid premature starting, which has so often led to accidents. This consists in so hanging the step that when a foot comes into contact with it, it is tilted inward and makes an electrical contact, which causes a red light to glow in front of the driver.

Special interest attaches to a prospectus issued this week by the Victoria Falls Power Company, asking for subscriptions to an issue of $4,500,000 preference shares. This prospectus has called forth a protest that the Victoria Falls Power Company, having secured the greater portion of its capital in Great Britain, has given all its orders for plant to Germany.

A new scientific society will shortly be inaugurated with the title of the Institution of Colliery and Mining Electrical Engineers.

A 200-volt tantalum lamp is now on the market in Great Britain in thirty-two and fifty candlepower sizes.

The Postmaster-General has definitely and finally established his right to be paid royalties by the National Telephone Company upon the rentals accruing from private wires. For some years past now, the company has refused to pay these royalties, claiming that they did not fall within the royalty clause of their license. These wires are wires rented for private purposes, as between an office and the works or the private house of the subscriber. After winning in the court of first instance, and losing in the Appeal Court, the Postmaster-General has gained the final verdict in the House of Lords, from which there is no appeal.

Contrary to general expectations, the London County Council has, on the advice of its Highways Committee, decided to abandon its experiment with the Griffiths-Bedell surface-contact system. G.

CONTINENTAL EUROPE.

(Special Correspondence.)

PARIS, APRIL 3.—The French Thomson-Houston Company has been manufacturing Curtis steam turbines at its Paris works, and as the business has greatly increased, it intends to erect a large factory in the neighborhood of Lille, in the north of France, which will be especially devoted to turbine manufacture.

It is proposed to build an electric railroad from Genoa to Milan, having a length of eighty-two miles. There will be twenty trains of three cars each daily. Each car will accommodate fifty passengers. The cost of the undertaking is figured at $46,000,000. On the line there will be 372 bridges and eighteen tunnels, one of which is twenty miles long.

Dr. Perot, a leading physicist of Paris, has been appointed professor of physics at the Polytechnic College, in the place of the late Professor Becquerel. Dr. Perot occupies an important post at the Paris Observatory, and is honorary director of the testing laboratory of the Arts and Trades Conservatory. A. DE C.

WESTERN CANADA.

(Special Correspondence.)

WINNIPEG, APRIL 16.—A large amount of work will be done this year on extending and improving the government telephone system of Manitoba. Already the local parliament has voted $800,000 for the purpose and it is expected that a still further sum will be voted at the next session of the legislature. Of this amount about half will be expended on day labor, while the other half will be for supplies. Underground and aerial work in Winnipeg will cost $160,000, while two new exchanges will be built in that city to relieve the present congestion. The one with the switchboard will cost $75,000, and the other $35,000. Extensions to long-distance lines are estimated to cost $156,000, while the cost of improvements to country exchanges will amount to approximately $104,000.

At the annual meeting of the Winnipeg Electric Railway Company, Winnipeg, Man., it was decided to issue debentures to the value of $1,500,000 for construction and improvements.

The City Council of Prince Albert, Sask., has decided to develop 10,000 electrical horsepower at Coal Falls, twenty-six miles south of that city. C. H. Mitchell, C. E., Toronto, Ont., has prepared preliminary plans. Address the mayor for further particulars.

At Brandon, Man., the Municipal Light, Heat and Power Company has been incorporated with a capital of $50,000. Address W. A. Thompson, Hamiota, Man.

The British Columbia Electric Company, Vancouver, B. C., has awarded a contract to the Great Northern Aluminum Company, Montreal, for the supply of 390 miles of aluminum transmission cable at $45,000. This is the first time in British Columbia that aluminum wire has been used for transmission purposes. R.

IMPORTANT DEVELOPMENTS.

(Special Correspondence.)

GALVESTON-HOUSTON RAILWAY INCREASES CAPITAL—The Galveston-Houston Electric Railway Company has filed an amendment to its charter increasing its capital stock $500,000, making it $3,500,000. The money will be used for extensions.

LARGE HYDROELECTRIC PLANT ABOUT TO BE BUILT IN CALIFORNIA—A dispatch from Red Bluff, Cal., states that President Jesse N. Churchill, of the Siskiyou Electric Power and Light Company, has announced that work on the new 60,000-horsepower plant will be commenced very shortly.

NEW STEEL PLANT AT YOUNGSTOWN, OHIO—The Republic Iron and Steel Company will utilize the $10,000,000 bond issue recently authorized to construct a new tube plant at Youngstown, Ohio, where the company already has large mills, at a cost of from $10,000,000 to $15,000,000. The new plant is to be of the most modern construction and will be largely equipped with electrical machinery.

LARGE ELECTRIC POWER PLANT IN NEW MEXICO—A large electric power plant is to be installed in Carthage, N. M., by Powell Stackhouse, Jr., and associates. The same parties own and operate extensive coal mines here, and this coal will be used to generate the power, which will be transmitted to Silver City, Deming, Albuquerque and El Paso. The power will also be used to operate pumping plants to irrigate the valleys of the different rivers which will be reached by the transmission lines, and to operate different industries in the cities to which the power will be transmitted. D.

WATERTOWN LIGHT AND POWER—The New York Upstate Public Service Commission has authorized the Watertown Light and Power Company to issue $455,000 of its common stock in place of stock of the Watertown Gas Light Company and the Watertown Light and Power Company by a consolidation of which companies the applicant company came into existence. The new company is also authorized to execute a consolidated mortgage upon its plants to the aggregate amount of $2,000,000 to secure $1,557,500 five per cent fifty-year bonds to retire the bonds of the Watertown Gas Light Company and the Watertown Light and Power Company.

LIGHTING AND POWER

(Special Correspondence.)

CALVERT, TEX.—The Calvert Electric Light Company will erect a new plant.

SENTINEL, OKLA.—This city will vote on the issuance of bonds for an electric-lighting system.

HEBER, ARK.—The Heber Light and Power Company has been incorporated with a capital stock of $10,000.

ARLINGTON, S. D.—The Lake Preston Milling Company will install an up-to-date electric-light plant in this city.

MAMMOTH SPRINGS, ARK.—Frank Hill, of Memphis, Ark., has been granted a franchise to establish an electric-light plant here.

ALBERT LEA, MINN.—The Albert Lea Light and Power Company will expend about $65,000 in the improvement of its plant. C.

SAN ANTONIO, TEX.—The San Antonio Gas and Electric Company will erect a new power plant, at a cost of about $125,000.

INDIANAPOLIS, IND.—The LeBaw Electric Company, Flora, capital stock $10,000, has been incorporated to furnish light for the town of Flora.

FRESNO, CAL.—The Sierra Park Power Company has been incorporated, with a capital of $100,000, to develop power from the San Joaquin River.

CABINET GORGE, IDAHO—The Northern Idaho & Montana Power Company will develop 75,000 horsepower at its power plant on Clark's Fork. The improvements will call for an expenditure of $2,000,000.

OROVILLE, CAL.—The Sierra Electric Power Company has been granted a franchise to erect electric power distributing systems in Butte County.

MONTPELIER, VT.—The South Royalton Power Company has been incorporated, with a capital of $10,000, to furnish power for Royalton and South Royalton.

PERRYVILLE, PA.—The building of the hydroelectric plant on Principio Creek has been completed, and Perryville's streets will hereafter be lighted by electricity.

PEABODY, MASS.—This town has decided by popular vote to continue in the lighting business and to appropriate $58,000 for improving the municipal lighting plant.

PORTLAND, ORE.—The Oregon Light and Power Company has been incorporated here, with a capital stock of $2,000,000, by H. H. Riddell, A. E. Murphy and N. L. Bailey.

LEAD, S. D.—The Homestake Mining Company is building an electric power plant at Spearfish Creek, with a maximum capacity of 7,000 horsepower, and to cost over $1,000,000. C.

GLENDALE, CAL.—The City Council has passed resolutions to expend upward of $60,000 in purchasing a site and constructing a municipal electric-light and power plant in this city.

BOSTON, MASS.—The Globe Electric Light and Gas Company, of Globe, Ariz., will issue $200,000 six per cent twenty-year sinking fund bonds and 10,000 shares of stock of $25 par value.

SAN FRANCISCO, CAL.—The San Benito Light and Power Company has been incorporated here, with a capital stock of $250,000, by C. W. Walker, T. D. Philby, Jr., H. P. Pitts, P. M. Reeves and H. M. Wright.

OROVILLE, CAL.—The Great Western Power Company, which has a 150,000-horsepower plant at Las Plumas, will build a distributing system to carry electric power to the island district on the Lower Sacramento.

PHILADELPHIA, PA.—Congress has appropriated $172,600, available July 1, for completing the central power plant at the Philadelphia Navy Yard. Estimates for the work will be invited soon after the appropriation is available.

COQUILLE, ORE.—The Coquille Mill and Mercantile Company has been granted a franchise to erect an electric power system in this city, with the stipulation that the company have its plant in operation within fifteen months.

CHICAGO, ILL.—The Oxford Junction Light, Power and Mill Company has been incorporated with a capital of $50,000 by W. C. Hill, A. Brothman, H. C. Smith and J. A. Swanson, all of this city, to operate a heat, light, power and milling plant.

UNION, IOWA—The Union Electric Power Company, of this city, has ordered from the Minneapolis Steel and Machinery Company a fifty-five-horsepower Muenzel producer gas engine and gas producer which they will install in their new electric-light plant. The engine will be belted to two generators.

GUADALAJARA, MEXICO—The Compania de Tranvias, Luz y Fuerza, is to construct a system of transmission lines from one of its generating plants here to the mining districts of Hostotipaquilla and Etzatlan in order to furnish electric power to operate the mines and mills in these districts. D.

DENVER, COLO.—The Animas Power and Water Company, which was incorporated four years ago with $3,000,000 capital, has been sold at Durango under foreclosure proceedings, being bought in by W. N. Vaile for $750,000 for the bondholders. The company will be reorganized with a capital stock and bond issue of $5,000,000.

DENVER, COLO.—A special meeting of the stockholders of the Telluride Power Company, which has a capitalization of $20,000,000, and a projected horsepower equal to that of the combined Central and Eastern Power companies, has been called for May 4 for the purpose of authorizing the directors to sell or lease its water rights.

SPOKANE, WASH.—The Spokane-Orient Power Company has been incorporated here with a capital stock of $1,000,000 by C. A. Luncheford, C. H. Patten, A. R. Patten and others. The company proposes to generate electric power on Boulder Creek, where a water-right has been secured, with a fall of 300 feet, capable of developing 2,500 horsepower.

OAKLAND, CAL.—The Central Oakland Power Company has been incorporated here, with a capital stock of $1,250,000, by A. M. Hunt, J. Fisher, J. K. Moffitt, M. S. Wilson, M. D. Levenson, F. G. Cartwright and C. N Beal. A site has been secured at the foot of Alice Street, where a power plant will be erected and power generated to supply Oakland and the surrounding territory.

GRAND FALLS, NEW BRUNSWICK—The work on the large hydroelectric development at Grand Falls on the St. John River is now well under way. In connection with it there has just been let one of the largest contracts for cement ever placed in the Dominion of Canada. It was awarded to the Vulcan Portland Cement Company, whose works are at Longue Point, Quebec. The order covers the entire cement requirements for the work and will amount to nearly 100,000 barrels of cement, which will be tested at the company's storage bins, where it will be reserved under seal and shipped in carload lots to the job as required, thus assuring the contractor that the cement will be up to the standard requirements when received.

LOUISVILLE, KY.—It is authoritatively announced that work will shortly be begun on a big ten-story building, situated in the heart of the city, which will be used as a power plant. The promoters are R. E. Hughes, F. Levy, Judge O'Doherty and L. Jones. The cost of the building is to be between $300,000 and $400,000, and it is estimated that it will be ready for occupancy by January 1, 1910.

SALISBURY, N. C.—A $50,000 transformer station will be built here by the Southern Power Company, which, it is stated, will make this point a distributing station for a large amount of territory in this section. The steel tower transmission line from Great Falls, S. C., via Monroe and Albemarle, N. C., is being put into operating condition and numerous nearby towns will use the power. L.

SEATTLE, WASH.—The Entiat Power Company has voted to increase its capital stock from $50,000 to $200,000. The Entiat company has been at work at the plant at Entiat for some time and has already completed a large dam in the Entiat River, constructed the canal and prepared a site for the power house. It is the intention of the company to put in one of the largest plants in Central Washington.

ASHEVILLE, N. C.—A franchise has been granted to G. E. Ladshaw, G. Cannon and A. L. White, all of Spartanburg, S. C., for the building and operation of a $249,000 power plant at Potts Shoals on Green River, a point seven miles from Henderson. The offices of the company will be at Henderson. It is understood that work will start at once. The company will furnish power for all purposes, and probably several manufacturing plants.

ELECTRIC RAILWAYS.

(Special Correspondence.)

EL PASO, TEX.—The El Paso Electric Railway Company will spend $450,000 this year in improvements.

LEWISTON, IDAHO—The Lewiston Terminal Company has been incorporated here with a capital stock of $100,000.

SANTA BARBARA, CAL.—The Pacific Improvement Company has applied for a franchise to build a trackless trolley power line in this city.

DUBUQUE, IOWA—It is stated that work will be commenced June 1 on the construction of an interurban road to Davenport, via Maquoketa. C.

HOOD RIVER, ORE.—The Valley Electric Railway Company has been organized to develop an electric line out of the west side of the valley into the Mount Hood country.

SANTA BARBARA, CAL.—The Pacific Improvement Company has announced its intention to install a trackless trolley system to the Hope ranch, a distance of four miles from this city.

HELENA, MONT.—The Montana Rapid Transit Company has been incorporated, with a capital of $5,000,000, to construct an electric line between Helena and Butte, via Jefferson, Boulder, Basin and Calvin.

BUTLER, PA.—It is officially reported that the franchises along the proposed line of the Clarion & East Brady Electric Railway have been granted. The company is capitalized at $300,000 in $50 shares.

WALLA WALLA, WASH.—Manager W. S. Mantrias, of the Columbia & Walla Walla Traction Company, announces that an electric line will be built soon from Wallula to Dayton and thence to the Snake River.

GRAND RAPIDS, WIS.—The Grand Rapids Street Railway Company has been formed to construct a line, ten miles long, to Nekoosa, at a cost of $50,000. Neal Brown, of Wausau, Wis., is president of the company. C.

BOULDER, COLO.—A miniature electric railway, to be completed by May 30, is being constructed by the Eldorado Springs Railway Company to run from the gate entrance of the springs to the pavilion and thence up Hogback Mountain.

WHEELING, W. VA.—An agreement has been entered into between Hon. Albert M. Schenk of this city and Pittsburg capitalists for the building of a trolley line between Wheeling and Pittsburg. Work will be started as soon as possible.

INDIANAPOLIS, IND.—A company to be known as the Fort Wayne & Toledo Railway has been organized at Harlan, Ind. R. P. Bastress of Harlan has been selected as general manager. The line will be fifty-five miles in length, and will connect Fort Wayne, Maysville, Ind., and Hicksville. The money has been raised or practically secured to build the road. It is the intention of the company to start construction work May 1. The capital stock is $100,000.

MEXICO CITY, MEXICO—An electric railway is to be constructed between this city and the city of Puebla, a distance of about 160 miles, by the Canadian syndicate controlling the Mexico Tramway Company and the Mexican Light and Power Company. D.

PHILADELPHIA, PA.—The Pittsburg Railways Company, of the Philadelphia Company, is preparing plans for some extensive changes during the year, and as a start has ordered 100 cars of modern type for use on the direct routes. These will cost $700,000.

TOWANDA, PA.—A franchise for 99 years, conditional that work must be commenced within one year and pushed forward expeditiously under penalty of forfeiture, has been granted to the Bradford County Traction Company to build a borough street railway system.

FRESNO, CAL.—The proposed $1,000,000 bond issue for the Fresno-Hanford Interurban Railroad will be purchased by the Cleveland Construction Company. Over $250,000 is to be spent in wages in the next few months. W. E. Davis, of the Cleveland Construction Company, is superintending the construction work.

MARQUETTE, MICH.—An electric railway connecting the cities of Ironwood and Bessemer has become assured. Right-of-way privileges have been granted to the Twin City Electric Company and the concern has given bond that the road will be completed within one year. Construction work will be started shortly.

ROCKVILLE, MD.—That an electric railway from Kensington to Sandy Spring is assured is evidenced by the fact that the work of construction has already been started at the Kensington end. It is understood that the force of workmen will be considerably increased within the next few weeks and that the work will be pushed.

ALLENTOWN, PA.—The Allentown & Reading Railway Company has announced it will build a line from Lyons to Alburtis and thence to Fogelsville. Besides this, the Lehigh Valley Transit Company intends to expend $1,000,000 in direct city improvements, including an Allentown trolley belt line. The stockholders are to vote, May 26, on a bond issue of $1,500,000, of which $500,000 will go to pay the floating debt. The rest will be utilized in building the belt line and improving the rolling stock and general transportation facilities.

HUNTINGTON, W. VA.—A deal has been consummated whereby the Ohio Valley Electric Railway of this city has purchased of the Chesapeake & Ohio Railway thirty-eight miles of abandoned line between Barboursville and St. Albans. This, together with twenty miles of new line to be built at once, will give traction service between here and Charleston. The deal involves $350,000. Senator Sproul, of Chester, Pa., and his associates financed the deal. It is the intention to have the electric line completed by November 1.

ALLENTOWN, PA.—The Inter-County Electric Company has been organized with a capital of $250,000 by Maxwell Bochow and others. The road will start at Lyons and go through Mertztown, Shamrock, Alburtis, Macungie, Emaus, through Salisbury Township, to Allentown, a distance of twenty miles. An extension will be built from Topton westward to Reading at the same time that the line from Topton to Allentown is constructed. It is proposed to ballast the roadbed like that of a steam road, on which to operate fifty-five foot long cars of the latest improved pattern.

COLLINGDALE, PA.—With the action of Borough Council in giving right-of-way to the Philadelphia & Delaware County Railway Company for extension of the line through the borough from Chester pike to the Sixty-ninth Street station of the Philadelphia Rapid Transit Company, all the rights now have been secured for the railway with the exception of through Aldan and Sharon Hill. The Interstate Railways Company, it is said, is projecting the road from Chester Pike to Sixty-ninth Street, which will mean a saving of almost an hour's time by direct connection from the Chester & Wilmington, via the trolleys to Collingdale, and then by the new fast line to Sixty-ninth Street. The line will be double-tracked. A fifty-foot roadway is to be built by the railway company paralleling its tracks from Sharon Hill to the West Chester pike.

EDUCATIONAL.

UNIVERSITY OF MINNESOTA—A special short course in Traction Engineering is advertised to open May 25 and to close June 18. No entrance examination is required for this course.

NEW YORK ELECTRICAL TRADE SCHOOL.—The New York Electrical Trade School, 39 West Seventeenth Street, New York city, has issued an attractive booklet describing its purpose, courses of instruction and other particulars. Students who cannot by reason of their employment attend the day courses have the advantage of the evening session, which is held from 7 to 9 p. m. on Mondays, Tuesdays, Wednesdays and Thursdays. Complete instruction in theoretical, practical and laboratory work is provided in practically all branches of electricity.

TELEPHONE AND TELEGRAPH.

(Special Correspondence.)

HORICON, WIS.—The Horicon Telephone Company has been incorporated with a capital of $10,000.

LANSING, MICH.—The Sunfield Telephone Company has been incorporated with a capital of $10,000.

LANCASTER, PA.—The Intercourse Telephone Company has been organized with a capital of $5,000.

PEEVER, S. D.—The Farmers' Telephone Company has been incorporated with a capital stock of $7,000.

THAMESVILLE, ONT.—The Thamesville Telephone Company has been incorporated with a capital of $10,000.

DENVER, COLO.—The Cache & Beaver Creek Telephone Company has been incorporated with a capital of $20,000.

MASON CITY, IOWA—The Portland Heights Telephone Company has been incorporated with a capital stock of $10,000. C.

OSKALOOSA, IOWA—The Home Telephone Company will expend about $50,000 in improving the service in Oskaloosa. C.

RALEIGH, N. C.—The Selma Telephone Company has been chartered, with $5,000 capital, by T. H. Atkinson and others.

SALT LAKE CITY, UTAH—The West Side Telephone Company of Milard, with a capital of $3,000, has been incorporated.

ERIE, MINN.—The Red Lake-Eastern Marshall Farmers' Telephone Company has incorporated with a capital of $10,000.

RIVERSIDE, CAL.—The Corona Union Telephone and Telegraph Company has been incorporated with a capital of $25,000.

DONIPHAN, MO.—The Ripley County Mutual Farmers' Telephone Company has been incorporated with a capital of $10,000.

BELLEVILLE, ARK.—W. C. Page and others have organized a telephone company to establish a rural system around this point.

YANCEYVILLE, N. C.—The Providence Telephone Company has been incorporated with $5,000 capital by J. G. Wilson and others.

ST. PAUL, MINN.—The Wheaton Telephone Company has been incorporated by O. H. Hallickson and others with a capital of $10,000.

CARTHAGE, TENN.—The Carthage Home Telephone Company has been incorporated with $5,000 capital by J. R. Curtis and others.

LEXINGTON, N. C.—The Pleasant Grove Telephone Company has been incorporated with $6,000 capital by J. E. Meredith and others.

HELENA, MONT.—The Flathead Telephone Company, of Kalispell, has been incorporated with a capital of $15,000 by B. Fox and others.

MADISON, WIS.—The Springfield Farmers' Telephone Company, of Taylor, has been incorporated with a capital of $6,000 by J. Lambert and others.

GREAT FALLS, MONT.—The Montana Independent Telephone Company will install an exchange and automatic system during the coming summer. C.

CORNING, IA.—John Anderson, manager of the local telephone exchange, has begun the system of improvements he intends putting in at a cost of $10,000.

LOVINGSTON, VA.—The Rockfish Telephone Company is incorporated with $5,000 capital; also the Peoples' Telephone Company of Wakefield, Va., $4,000 capital. L.

IOWA FALLS, IOWA—The Morgan & Oakland Township Telephone Company has been incorporated to install rural telephone lines in Oakland and Morgan townships, north of here. C.

OAKLAND, CAL.—A fifty-year franchise has been granted to the Home Telephone Company, of Alameda County, for the sum of $2,500, for the extension of its telephone system to any part of the county.

INDIANAPOLIS, IND.—The Pretty Prairie Telephone Company, Lagrange County, has been organized with a capital stock of $4,000; also the Fall Creek Telephone Company, Ingalls, Madison County, capital $1,500.

LEWISTOWN, PA.—A gang of line and ground men is extending the Ferguson Valley Telephone Company's lines from McVeytown westward, taking in Atkinson Mills, Beaver Dam and eventually Newton, Hamilton, Mt. Union and the greater part of Mifflin County.

LANDER, WYO.—The Kemmerer-Big Piney Telephone Company, besides building an extension to Rock Springs, announces that it will extend from this place to Hudson, Riverton and Shoshoni, thus entering into competition with the Rock Mountain Bell Telephone Company at all these places.

SALT LAKE CITY, UTAH—The Utah-Nevada Telephone Company will build over 600 miles of new toll line in Utah and Nevada, a majority of which will constitute extensions of the present toll system west from Salt Lake, thus bringing into close touch with Salt Lake many additional towns and mining camps.

HOUSTON, TEX.—It is stated on the highest authority that steps have been taken toward rehabilitating or dissolving the Citizens' Telephone Company, not only in Houston, but throughout the state wherever the company operates or maintains exchanges. Whichever method is carried out Houston will benefit to the extent of a $1,000,000 telephone plant.

WINNIPEG, MANITOBA—Eight hundred miles of new telephone lines in the province of Alberta is the probable estimate of what the telephone branch of the Alberta public works department will construct this year. The mileage for last year was about 800 miles, but the demands this year are greatly in excess of anything the telephone superintendent has known. If all the demands from the four quarters of the province were granted, there would be between 2,000 and 3,000 miles constructed instead of 800.

NEW YORK, N. Y.—A shorter cable to England is planned by the Commercial Cable Company of New York, according to the *Engineering News*. It is proposed to cut one of this company's five transatlantic cables at the Flemish Cap, 300 miles east of Newfoundland, and to attach to the European end a new cable running to St. Johns, Newfoundland, and thence to New York city. It is expected that this redivision of the line between New York and Ireland will increase the speed of transmission by 35 per cent. This change has been made possible by the expiration of the exclusive rights of the Anglo-American Cable Company to land cable in Newfoundland. Some 1,700 miles of new cable will be laid if this plan is carried out and the 900 miles between the Flemish Cap and Canso, Canada, will be recovered and resheathed for use elsewhere.

LEGAL NOTES.

IMPROPER TELEGRAMS—The right of a telegraph company to refuse to transmit a message which is not libelous or obscene, on the theory that it is improper, is denied in Western Union Telegraph Company vs. Lillard (Ark.), 110 S. W. 1,035, 17 L. R. A. (N. S.) 836.

LIABILITY FOR MOTORMAN'S ASSAULT—The liability of a street-car company for an assault by its motorman upon a passenger who has left the car to stop a fight between the conductor and a passenger who has been ejected from the car is denied in Zeccardi vs. Yonkers Railway Company, 190 N. Y. 389, 83 N. E. 31, 17 L. R. A. (N. S.) 770.

CONDITION OF STREET-RAILWAY PAVEMENTS—A municipal ordinance requiring street railways to keep the space covered by their tracks in thorough repair is held, in Miller vs. United Railway and Electric Company (Md.), 69 Atl. 636, 17 L. R. A. (N. S.) 978, not to make them insurers of the safety of passengers using such portion of the street.

TRANSFER RIGHTS—A passenger on a street car, who being entitled to a transfer to another line, which is not given him before the transfer point is reached, continues to demand it after he has reached the ground at the transfer point in obedience to the conductor's command to get off the car and out of the way, is held, in Blomsness vs. Puget Sound Electric Railway, 47 Wash. 620, 92 Pac. 414, 17 L. R. A. (N. S.) 763, not to have lost his rights as a passenger so as to absolve the company from liability for an assault upon him by the conductor, growing out of the altercation.

INJURY DUE TO COLLISION BETWEEN STREET CAR AND WAGON—Although one driving along a street ahead of a street car which is running so slowly that he has time to cross the track without being struck is negligent in making the attempt, it is held, in Smith vs. Connecticut Railway and Light Company, 80 Conn. 268, 67 Atl. 888, 17 L. R. A. (N. S.) 707, that his act is not the proximate cause of his resulting injury if, upon seeing his design, the motorman because of his inexperience becomes confused, releases the brake, and causes the car to increase its speed, so that it strikes the wagon, which it would not do if he used ordinary care.

LOW SAGGING TELEPHONE WIRES OVER ROAD CROSSINGS—In Weaver vs. Dawson County Mutual Telephone Company, 118 Northwestern Reporter, 650, the Supreme Court of Nebraska holds that a telephone company is guilty of negligence when it places its telephone wires only thirteen feet above a road crossing and permits such wires to become slack and to sag until they interfere with legitimate travel, when the statute requires such wires to be placed twenty feet above the road crossings. In the statutory provision the words "all road crossings" are held to refer to private as well as public roads. A person traveling along a road that is crossed by a telephone line is not bound to anticipate danger at such crossings, and is not required to examine or look to see if there is danger before passing under such wire.

ELECTRICAL SECURITIES.

The market during the past week showed a fine example of reaction to the manipulation which has been going on for some time past, and, unsupported by popular interest, there were some setbacks in some of the leaders. The whole story of the week's doings is made up of quite wide fluctuations in prices, with, if anything, a settling tendency all around. The indifference to many issues and the continued slow revival of business is causing some apprehension. At the same time hardware lines and building in general appears to be growing very active, and this of course augurs well for a busy season during the summer months.

Dividends have been declared upon the following electrical securities: Havana Electric Railway Company; the regular quarterly dividend of one-and-one-half per cent on the preferred stock, and also the regular quarterly dividend of one per cent on the common stock, both dividends payable May 15 to stock of record April 24. Commonwealth Edison; the regular quarterly dividend of one-and-one-half per cent, payable May 1. Twin City Rapid Transit Company; the regular quarterly dividend of one-and-one-fourth per cent on the common stock, payable May 15. Columbus Railway Company; the regular quarterly dividend of one-and-one-fourth per cent on the preferred stock, payable May 1 to stock of record April 15. East St. Louis & Suburban Company; the regular quarterly dividend of one-and-one-fourth per cent on the preferred stock, payable May 1 to stock of record April 15. Edison Electric Illuminating Company of Boston; the regular quarterly dividend of two-and-one-half per cent, payable May 10 to stock of record April 15. Albany Home Telephone Company; the regular quarterly dividend of one per cent, payable April 20. Michigan State Telephone Company; the regular quarterly dividend of one-and-one-half per cent on the preferred stock, payable August 2; also a regular quarterly dividend of one-and-one-half per cent on the common stock, payable June 1. United Electric Securities Company; the regular semi-annual dividend of $3.50 a share on the preferred stock, payable May 1 to stock of record April 22. American District Telegraph of New Jersey; the regular dividend of one per cent, payable April 22. Electrical Securities Corporation; the regular semi-annual preferred dividend of two-and-one-half per cent, payable May 1 to stock of record April 26. American Gas and Electric Company; the regular quarterly dividend of one-and-one-half per cent on the preferred stock, payable May 1 to stock of record April 19. Grand Rapids Railway; the regular quarterly dividend of one-and-one-fourth per cent on the preferred stock, payable May 1 to stock of record April 15. Mexico Tramways Company; the regular quarterly dividend of one-and-one-half per cent, payable May 1.

ELECTRICAL SECURITIES FOR THE WEEK ENDED APRIL 17.

New York:	*Closing.*
Allis-Chalmers common	15
Allis-Chalmers preferred	47
American Tel. and Tel. Company	137¼
Brooklyn Rapid Transit	76⅜
General Electric	156
Interborough-Metropolitan common	15⅛
Interborough-Metropolitan preferred	43¾
Kings County Electric	121
Mackay Companies (Postal Telegraph and Cables) common	75¼
Mackay Companies (Postal Telegraph and Cables) preferred	72½
Manhattan Elevated	143¼
Metropolitan Street Railway	22
New York & New Jersey Telephone	122
Western Union	69¾
Westinghouse Manufacturing Company	81½

For the first eleven days of April gross earnings of the Brooklyn Rapid Transit system averaged $52,086 per day, compared with $49,125 per day a year ago, an increase of $2,961 per day.

Boston:	*Closing.*
Edison Electric Illuminating	258
Massachusetts Electric	71
New England Telephone	133
Western Telephone and Telegraph pref.	78
Philadelphia:	*Closing.*
Electric Company of America	12½
Electric Storage Battery common	45
Electric Storage Battery preferred	45
Philadelphia Electric	11⅞
Philadelphia Rapid Transit	33¼
United Gas Improvement	88¾

At the Philadelphia Electric annual meeting the stockholders approved the report for the year. Directors were re-elected.

Chicago:	*Closing.*
Chicago Telephone	133
Commonwealth Edison	113½
Metropolitan Elevated preferred	—
National Carbon common	82
National Carbon preferred	118

PERSONAL MENTION.

A. P. LATHROP has been elected president of the American Light and Traction Company.

M. L. KOHLER, of Philadelphia, Pa., was elected president of the Chicago Mica Company, at the annual meeting on April 14.

ARTHUR D. DANA, president and treasurer of the Chicago Fuse Wire and Manufacturing Company, returned last week from his European trip.

E. P. FEATHERSTONEHAUGH, B. SC., of McGill University, has been appointed to fill the chair of electricity at Manitoba University, Winnipeg, Man. R.

THOMAS E. MITTEN, president of the Chicago City Railway Company, has sailed for Europe. Vice-president R. B. Hamilton will be acting president in Mr. Mitten's absence.

DR. W. H. TOLMAN has been detailed for field work by the executive committee of the Museum of Safety and Sanitation, of which he is director, and will start May 1 on a lecturing tour.

WILLIAM HENRY KELLER, until recently chief electrician of the New River Collieries Company, Thurmond and Prince, W. Va., has opened an office in Charleston, W. Va., as consulting electrical engineer in mining practice and equipment.

J. W. FOSTER, southeastern representative of the Holophane Company, was in attendance at the Southern Electrical and Industrial Exposition at Louisville for the last two weeks demonstrating the utilization of proper reflectors for stores and offices, and for home lighting. Mr. Foster made his headquarters at the booth of the James Clark, Jr., Electric Company.

CHARLES T. PORTER has been awarded the John Fritz medal by the four national engineering societies for his part in the origination of the modern high-speed steam engine. This medal is awarded annually for notable scientific or industrial achievement and the previous recipients, in order, were Lord Kelvin (1905), George Westinghouse, Alexander Graham Bell and Thomas A. Edison.

FREDERICK SCHEETZ JONES, for twenty years professor of physics in the University of Minnesota, has been appointed dean of Yale College, where he begins his duties next July. Professor Jones will be greatly missed at Minnesota, where, besides being professor of physics, he has for a number of years been dean of the College of Engineering and head of the athletic interests in the university.

PROF. F. B. BADT, the well-known consulting electrical and mechanical engineer, of F. B. Badt & Company, Chicago, is distributing an interesting little pamphlet on the causes and cure of baldness, translated by himself from "Die Haarkur von Dr. Karl Cleven, Berlin." It is "dedicated to his bald-headed friends and to those who are preparing to join their society." At a recent meeting of the Chicago Electric Club, Professor Badt was found surrounded by a group of bald-headed ones, who listened eagerly and hopefully to the professor's dissertation upon alopecia furfuracea.

CHARLES J. GLIDDEN, of early telephone fame, now a notable automobilist and aeronaut, is having established in his apartments at the Hotel Somerset in Boston one of the most powerful wireless apparatus in use. The receiving instruments will take up messages sent from all land stations and steamers within a radius of 3,000 miles, and it is expected that the transmitter will have a range exceeding 1,000 miles. Mr. Glidden will conduct experiments looking to the development of the use of wireless apparatus with aerial craft. Mr. Glidden's famous balloon "Massachusetts" will be so equipped.

NORMAN B. HICKOX, in charge of the new light and power business for S. S. Bush of Louisville, Ky., left De Kalb, Ill., during the week, after a stay of three-and-one-half months, to make a tour of the South, stopping at each central station controlled by Mr. Bush, making a stay at each place of from one to four months. Mr. Hickox expects to arrive in De Kalb again in about a year. Mr. Hickox was formerly of Springfield, Ill., where he was associated with the Springfield Railway and Light Company, and was more recently connected with the sales department of the General Electric Company in the Chicago office.

L. A. HERDT has been appointed a full professor of electrical engineering at McGill University, Montreal, Canada. Mr. Herdt graduated in mechanical engineering at McGill, class of 1896, and further pursued his studies in Paris and in Liege, Belgium, in electrical engineering. After serving on the staff of the Thomson-Houston Electrical Company of France for some time, Mr. Herdt returned to his alma mater and was successively demonstrator, lecturer, assistant professor and associate professor in electrical engineering up to the time of his appointment as full professor. Professor Herdt is a consulting engineer of some note and is an 'Officier d'Academie' of France.

FRANK L. TUFTS, adjunct professor of physics at Columbia University, New York, was instantly killed during the night of April 15. Professor Tufts was testing on the high-tension distributing system of the Public Service Corporation of New Jersey, at Bayonne, N. J. Professor Tufts was thirty-five years old and had been married three years. He was a B. S. of Antioch, in 1891, and an A. B. of Harvard, in 1894. He graduated from Columbia, class 1896, with a degree of A. M., and received a Ph. D. a year later. He was made a tutor in physics at Columbia in 1898. In 1903 he was appointed instructor in physics and held the title of adjunct professor since 1905. He is survived by Mrs. Tufts and an infant son.

NEW PUBLICATIONS.

INDIAN INDUSTRIES AND POWER—The February issue of the *Indian Industries and Power*, published at Bombay, is a fine double number, devoted to a résumé of electrical and mechanical developments in this great eastern country. There is a comprehensive illustrated description of the tramways system of Bombay and a number of other articles devoted to some of the local industries.

REPORT OF THE INTERNATIONAL CONFERENCE ON ELECTRICAL UNITS AND STANDARDS—The official report of the International Conference on Electrical Units and Standards that was held in London last fall has been published as a twenty-four-page pamphlet, including the French and German translations. This report was abstracted at considerate length in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN of November 7 and 21, 1908.

WHO MAKES WHAT—This extremely valuable reference book for buyers and makers is a geographically-alphabetically arranged list of the names and addresses of more than 12,000 manufacturers in all parts of the United States. Contained in its 368 pages are separate directories of manufacturers, products, foreign merchants, wholesale hardware merchants, jobbers and exporting houses. "Who Makes What" is published by D. T. Mallet, New York city. The price is one dollar, prepaid.

AMERICAN STREET AND INTERURBAN RAILWAY ASSOCIATION—The American Street and Interurban Railway Association has published in bulletin form several interesting pieces of literature. These are entitled, respectively, "Facts of Interest Regarding the Membership of the Association," giving a complete list of the active and associate members and a brief historical résumé; "The Future of the American Street and Interurban Railway Association," by James F. Shaw, president; "The Value of the Association's Work," by the Hon. W. Caryl Ely, and "The Fare Question," which is contributed to by a number of prominent street-railway men.

LIGHTING COUNTRY HOMES—On account of the demand for Bulletin No. 25 of the Engineering Experiment Station, University of Illinois, another edition has been printed and copies are now available for distribution on application to the director, Prof. L. P. Breckenridge, Urbana, Ill. This bulletin is entitled "Lighting Country Homes by Private Electric Plants," by T. H. Amrine, and includes explanations concerning artificial illumination, selection of lighting fixtures, the planning of a house-lighting system, the design and estimate of the cost of a small private plant, suggestions about ordering apparatus and instructions for its operation and care.

EDISON ROUND TABLE—The first number (April) of the *Edison Round Table*, which is the monthly magazine of the Commonwealth Edison Company Branch of the National Electric Light Association, has made its appearance. It is ably edited by R. F. Schuchardt and Harold Wright, who have combined in a quaint combination of the serious and humorous many articles and anecdotes of interest to the members of the local Chicago branch. There are also included a large number of news items regarding persons and events in the company's various departments, all tending to keep the large number of employes informed of the ramifying activities in all directions and to cement the individuals into a large family for their mutual interests.

INDUSTRIAL ENGINEERING—Volume I, No. 1, of *Industrial Engineering* has been issued by the Industrial Engineering Publishing Company, of Pittsburg, Pa. This magazine, the editorial announcement states, is to be devoted to the interests of works managers, engineers and superintendents. The first number is well filled with carefully prepared articles of a generally interesting nature, and these are varied enough to suit the engineer in search of instruction along these special lines. In addition to the purely technical contributions there is an interesting editorial section and a good industrial section. The following is the first table of contents: "Principles of Heating and Ventilating a Modern Building," by H. W. Woodward; "Elasticity and Fatigue of Wrought Iron and Steel," by Henry S. Prichard; "A Test of a Terra-Cotta Tile Column;" "Feed Water Heaters as Purifiers," by J. C. William Greth; "The Plant of the Detroit Lubricator Company;" "Salient Points in Steel Mill Buildings," by J. H. Heuser; "Antecedents and Development of the Machine Hour Idea—1," by F. E. Webner; "Modern Material-Handling Machinery for Industrial Plants—1," by A. G. A. Schmidt; "Employer, Employe and the Community," by H. F. J. Porter; "Eliminating Wastes in Steam Generation," by Carl S. Dow; "The Induction Motor Drive in a Printing Plant."

NEW PROPOSALS.

ELECTRIC POWER FRANCHISE, SANTA BARBARA, CAL.—Bids will be received by the Santa Barbara (Cal.) City Council up to May 6 for a franchise for the construction of an electric distributing system in the city.

ELECTRIC LIGHTING, HOBOKEN, N. J.—Bids will be received by the City Council of Hoboken, N. J., up to 4 p. m., April 28, for electric arc lights, gas lights, hydrocarbon lights, or other lights for city lighting. Specifications are on file in the city clerk's office.

FORECLOSURE SALE OF POWER COMPANIES, SAN FRANCISCO—Bids will be received by George H. Whipple and Vanderlynn Stowe, at San Francisco, up till May 10, for the sale of the properties of the Stanislaus Electric Power Company and the Tuolumne Water Power Company to satisfy the mortgage of the Knickerbocker Trust Company, New York city.

VARIOUS BUILDINGS, COLUMBUS BARRACKS, OHIO—The office of the Constructing Quartermaster, Columbus Barracks, Ohio, will receive sealed proposals, in triplicate, until 10 a. m., standard time, May 1, for the construction of an administration building, a recruit-receiving barrack, a barrack for 300 men, and a fire station, at this post, including plumbing, heating, electric wiring, and electric-lighting fixtures. Information, blank forms for proposals, etc., furnished on application. Envelopes containing proposals to be indorsed: "Proposals for Public Buildings, to be opened May 1, 1909," and addressed to Capt. H. J. Hirsch, Constructing Quartermaster.

ISTHMIAN CANAL COMMISSION, WASHINGTON, D. C.—Sealed proposals will be received at the office of the General Purchasing Officer, Isthmian Canal Commission, Washington, D. C., until 10:30 a. m., May 6, 1909, for furnishing the following articles: Semi-marine boilers, air compressor, fire-alarm system, electric motor, electric-driven wood-working machines, machine-shop machines, tin and coppersmith tools, drill chucks, vises, sheave, shafting, rock-drill steels, cypress water tank, hose, lumber, etc. Blanks and general information relating to this circular (No. 503) may be obtained from this office or the offices of the assistant purchasing agents, 24 State Street, New York city; custom house, New Orleans, La., and 1086 North Point Street, San Francisco, Cal.; also from the United States engineer offices in the following cities: Seattle, Wash.; Los Angeles, Cal.; Baltimore, Md.; Philadelphia, Pa.; Pittsburg, Pa.; Boston, Mass.; Buffalo, N. Y.; Cleveland, Ohio; Cincinnati, Ohio; Chicago, Ill.; St. Louis, Mo.; Detroit, Mich.; Milwaukee, Wis.; St. Paul, Minn.; Chattanooga, Tenn.; Louisville, Ky.; Mobile, Ala., and Galveston, Tex.; Commercial Club, Kansas City, Mo.; Chamber of Commerce, Quincy, Ill., and Chamber of Commerce, Tacoma, Wash.

DATES AHEAD.

American Electrochemical Society. Next meeting, Niagara Falls, Ontario, May 6-8.

Omaha Electrical Show. Omaha Auditorium, Omaha, Neb., May 6-15.

Nebraska Electrical Association. Annual convention, Omaha, Neb., May 11-13.

Arkansas Association of Public Utility Operators. Annual meeting, Hot Springs, Ark., May 12, 13, 14.

Southwestern Electrical and Gas Association. Annual convention, Dallas, Tex., May 20-22.

Ohio Society of Mechanical, Electrical and Steam Engineers. Annual convention, Canton, Ohio, May 21-22.

American Association of Electric Motor Manufacturers. Annual convention, Hot Springs, Va., May 24-27.

West Virginia Independent Telephone Association. Annual convention, Parkersburg, W. Va., May 27-28.

National Electric Light Association. Annual convention, Atlantic City, N. J., June 1-4.

Association of Edison Purchasing Agents. Annual convention, Atlantic City, N. J., June 1-4.

American Railway Master Mechanics' Association. Annual convention, Atlantic City, N. J., June.

Master Car Builders' Association. Annual convention, Atlantic City, N. J., June.

Canadian Electrical Association. Annual convention, Quebec, Canada, June 16-18.

Association of Railway Telegraph Superintendents. Next meeting, Detroit, Mich., June 23.

American Institute of Electrical Engineers. Annual convention, Thousand Islands, N. Y., June 28.

Ohio Electric Light Association. Annual convention, Toledo, July 13-15.

National Electrical Contractors' Association. Annual convention, Toledo, Ohio, July 21-23.

INDUSTRIAL ITEMS.

THE H. KRANTZ MANUFACTURING COMPANY, Brooklyn, N. Y., has issued for distribution Bulletin No. 12, describing bushings and pipe clamps.

THE UNION SWITCH AND SIGNAL COMPANY, Swissvale, Pa., has published a very comprehensive catalog and price-list of interlocking and signaling devices.

H. G. OSBORNE, New York city, manufacturer of extension brick and stone drills, has removed his office and stock from 74 Cortlandt Street to 157 Chambers Street.

THE BUCKEYE ENGINE COMPANY, Salem, Ohio, has appointed Louis Bendit its Kansas City sales manager (504 New York Life Building) and J. R. Detweiler its Wichita, Kan., district manager (505 Barnes Building).

WICKES BROTHERS, Saginaw, Mich., have published their "Monthly Stock List" for April of boilers, engines, dynamos, motors and machinery. Those looking for new or second-hand goods in these lines should apply for a copy.

THE BUCKEYE ELECTRIC COMPANY, Cleveland, Ohio, has issued for distribution to the trade a folder giving some convincing arguments for dealers and central-station men whereby to increase the sale and use of Buckeye tungsten lamps.

THE METROPOLITAN ELECTRICAL SUPPLY COMPANY, Chicago, Ill., has issued a special fan-motor catalogue. All the standard forms are shown, but particular attention is given to an improved oscillating fan. Catalogue and prices will be sent on request.

THE DUBOIS IRON WORKS, of DuBois, Pa., has published Bulletin E-P No. 3, which treats of pumps for all kinds of liquids, fresh, salt, acid, clear, gritty, cold and hot. These pumps are driven either by belting or directly by electric motors or gasoline engines.

THE CUTLER-HAMMER CLUTCH COMPANY, Milwaukee, Wis., has just issued a very attractive catalogue of lifting magnets. All who are interested in the rapid and economical handling of iron and steel, especially in bulk, should write for a copy of this publication.

THE BRISTOL COMPANY, Waterbury, Conn., has issued an illustrated folder describing a partial list of their recording pyrometers, thermometers, etc., and announces that a larger catalogue of pressure and vacuum recording gauges will soon be ready for distribution.

THE CROCKER-WHEELER COMPANY, Ampere, N. J., has supplied three motors, aggregating 225 horsepower, to the Carnegie Steel Company for rolling-mill work. This makes a total of 1,775 horsepower in motors ordered by this firm from the Crocker-Wheeler Company.

THE STAR EXPANSION BOLT COMPANY, Bayonne, N. J., manufacturers of expansion bolts, toggle bolts, cable hangers, drills and drill holders, has removed its general offices from Bayonne to 147 Cedar Street, New York city, where a very complete stock will be maintained at all times.

THE NATIONAL MACHINERY AND WRECKING COMPANY, Cleveland, Ohio, announces the issue of a "Special Bargain List" with lowest prices on direct and alternating-current generators, both belted and direct-connected Corliss and automatic engines, leather belting and extra armatures.

THE ELECTRO-AD COMPANY, Detroit, Mich., has moved into larger quarters and is installing new machinery for the purpose of manufacturing on a much more extensive basis its motorless flashers, advertising devices, window novelties and electrical displays. The new address is 265 Jefferson Avenue.

THE INDUSTRIAL INSTRUMENT COMPANY, Foxboro, Mass., is distributing a bulletin describing its standard electric time systems. This system has been particularly developed for use in industrial and commercial plants. The company will be pleased to send bulletins to those interested upon request.

THE NEW YORK INSULATED WIRE COMPANY, of New York city, is distributing a set of blotters that are unique in describing the details of the manufacture of its products. Emphasis is placed on the purity of the various materials and processes used in making insulating tapes, and the insulation of wires and cables.

THE CENTRAL ELECTRIC COMPANY, Chicago, Ill., is distributing a new circular, entitled "A Little Fuse History," or "Buy While the Buying's Good," which, in addition to calling attention to the history of D & W fuse development, also emphasizes the fact that the present prices are extremely low. Copies will be sent upon request.

THE HILL CLUTCH COMPANY, Cleveland, O., has issued a booklet containing an article entitled "Tests of Friction Clutches for Power Transmission," by Prof. R. G. Dukes. This is a reprint of a paper presented at the last annual meeting of the American Society of Mechanical Engineers. Copies will be furnished to those interested upon request.

THE D'OLIER ENGINEERING COMPANY, Philadelphia, New York and Pittsburg, in Catalogue T, illustrates and describes its horizontal centrifugal pumps, suitable for direct electric drive. A feature of these pumps is the ready accessibility of all parts for inspection, repair, or renewal. They are designed to operate economically with heads up to nearly two hundred feet in a stage.

THE STROMBERG-CARLSON TELEPHONE MANUFACTURING COMPANY, Rochester, N. Y., announces the issue of pamphlets No. 13 (Magneto Telephones for Electric Interurban and Steam Railway Despatching Systems) and No. 14 (No. 896 Compact Type Series and Bridging Dry Battery Wall Telephones. Two-Piece Desk Telephones). These are ready for free distribution.

THE NERNST LAMP COMPANY has published a thirty-two page advance bulletin devoted to Westinghouse-Nernst chandeliers and ornamental lamps. The richness of the designs shown in both the Renaissance and Art Nouveau styles bears out the company's assertion that the new Westinghouse-Nernst lamp is peculiarly adapted to the production of not only efficient but highly artistic fixtures.

THE SPRAGUE ELECTRIC COMPANY, New York, has issued for distribution a new catalogue (No. 424), describing its various types of conduit, conductors, boxes, fittings, etc. Among the newer types may be mentioned the single-strip flexible steel conduit, which is designed especially for fireproof construction. Special mention is also made of the new Multilet box, which is one box with many uses.

THE DARLEY ENGINEERING COMPANY, of Pittsburg, Pa., has issued its second bulletin devoted to its system of suction conveyors for handling ashes. Besides giving a complete description of this system for economically and conveniently removing the ashes from boiler plants into storage tanks, the bulletin explains the details of the apparatus and its advantages and shows a large number of views taken in typical installations.

THE NAUGLE POLE AND TIE COMPANY, Chicago, Ill., is distributing a fine halftone, reproduced from an actual photograph, of the immense stock of poles and ties in their Chicago yard. When it is taken into account that the bulk of their stock is carried in their northern yards, and that this enormous pile of lumber is used only for rush shipments, one can appreciate dimly the gigantic dimensions of the business in poles and ties of this company.

THE GREGORY ELECTRIC COMPANY, Chicago, Ill., has issued its monthly "Bargain Sheet" for April, which is full of bargains for sale in all kinds of electrical machinery, appliances and equipment. All items are put in thorough working order, and articles are sold under a guarantee to refund purchase money if returned prepaid and in good condition. Of course, it is a case of "first come, first served," and all quotations are subject to prior sale.

THE DALE COMPANY, New York, has issued supplementary catalogue 15A, containing illustrations, descriptions and prices of their tungsten lamp fixtures, which have the merit of being comparatively inexpensive, although they are not only artistic but also quite substantial in construction. Supplementary catalogue 15B, of wireless clusters, both detachable and regular types, is also ready for distribution. The Dale Company states that 10,000 square feet of floor space have been added to their premises, and that considerable new equipment and additional facilities have been installed.

THE PETTINGELL-ANDREWS COMPANY, Boston, Mass., has issued the April number of its monthly publication, "Juice," containing "live information about electrical material." Contained in this number are articles by A. S. Wade on "Crossarm Timber," and C. O. Baker, on "The Essentials of an Effective Street Fixture," besides other miscellaneous information. Some standard specialties of electrical manufacturing companies represented by the Pettingell-Andrews Company, and also some of their own wares, are listed.

THE ELECTRIC CONTROLLER AND MANUFACTURING COMPANY, Cleveland, Ohio, has issued the April number of its interesting and instructive little magazine, "Common Sense," which is distributed free to the trade, and at a charge of ten cents per number to outsiders or for duplicate copies. Besides some truisms and business maxims, hints and statistics, there is contained an article on magnetic switch controllers in general and the manually-operated controller for 100-horsepower motors, manufactured by the company, in particular.

THE ALLIS-CHALMERS COMPANY, Milwaukee, Wis., has issued for distribution Bulletin No. 1059, on engine-type direct-current generators, designed for general lighting and power service. These machines are suitable for direct-connection to steam, gas or oil engines. This bulletin contains illustrations of installations where these machines may be seen in operation. The various parts are also shown separately, and among them is the patented brush holder, designed to accommodate itself to irregularities of the commutator. The company has also issued Bulletin No. 1058, containing illustrated descriptions of typical interurban railways equipped by this concern.

THE DIELECTRIC MANUFACTURING COMPANY, of St. Louis, Mo., announces that it is ready to place on the market a new insulating compound, called Petrite, which is particularly adapted for insulating coils of all kinds. It has been tried out with complete success for two years on generator and motor field coils, also arc lamp and transformer coils. It is said that the material is unaffected by any oil at any temperature and does not run out of the finished coil at any temperature. It is a strong and tough material that supports and, in fact, "petrifies" the coil. Petrite is applied by brushing it on the coil as it is being wound up, or by running the wire through a bath of the compound just before the wire is placed on the winding mold, a baking oven being the only requisite in its use. One-half pint samples may be had on request.

THE GOULD STORAGE BATTERY COMPANY, whose main offices are at 341-347 Fifth Avenue, New York city, has just issued an attractive catalogue, entitled "The Gould Battery in Isolated Lighting Plants." This veritable treatise on the subject of storage batteries should be in the hands of everyone at all interested in the subject. It contains minute instructions, with many illustrations and extremely practical diagrams, on the arrangement of switchboards, etc., for many of the cases which occur in everyday practice in connection with battery installations. Besides some terse and timely comments on the advantages of storage batteries for isolated plants, there are practical articles on the selection of batteries, methods of operation, arrangements and resistance regulations for charging and discharging, choice of plant, charging rates, details of installation, wiring, etc., together with comprehensive tables showing much of this information and the types and prices of the batteries recommended in the various particular cases discussed. The catalogue is a welcome addition to storage-battery literature.

RECORD OF ELECTRICAL PATENTS.

Issued (United States Patent Office) April 13, 1909.

917,749. CIRCUIT CONTROLLER. Sewall Cabot, Brookline, Mass. Filed November 10, 1908. A wireless-telegraph transmitter has a motor-driven serially-divided drum co-operating with a set of stationary electrodes, the gaps between which are practically closed and the circuit rendered substantially complete in an interval after the first discharge of the condenser sufficiently short to minimize spark-gap losses.

917,760. SWITCH. Gerald W. Hart, Hartford, Conn., assignor to The Hart Manufacturing Company, Hartford, Conn. Filed November 2, 1907. An electromagnetically controlled detent has an energizing coil located in the circuit controlled by the switch and adapted when energized to restrain the switch and hold it closed.

917,763. ELECTRIC SIGNALING SYSTEM FOR RAILWAYS. John S. Holliday, Wilkinsburg, Pa., assignor to The Union Switch & Signal Company, Swissvale, Pa. Filed January 30, 1908. There are means for impressing two-phase currents upon the rails and signal-controlling relays having two coils, connected one to each track rail and both connected to a common return conductor.

917,778. MEANS FOR STARTING ARC LAMPS. George M. Little, Pittsburg, Pa., assignor to Westinghouse Electric & Manufacturing Company. Filed May 6, 1907. The clutch-lifting magnet has about it a shunt containing a switch controlled by an electromagnet and a dashpot.

917,780. SERIAL IGNITER FOR GAS ENGINES. Hubert A. Long, Eureka, Cal. Filed November 3, 1908. Has a stationary electrode with a number of contacts and a revolving electrode with a single contact arranged to consecutively engage the stationary ones.

917,785. INSULATING-SUPPORT FOR HIGH-TENSION CONDUCTORS. Ralph D. Mershon, New York, N. Y. Filed May 21, 1907. Comprises a framed structure for resolving the mechanical forces originating in the conductor into components and having insulating members convergent toward the conductor for resisting such components.

917,787. PROCESS OF MAKING STORAGE-BATTERY PLATES. William Morrison, Chicago, Ill., assignor to Exmoor Storage Battery Company, Chicago, Ill. Filed January 12, 1905.

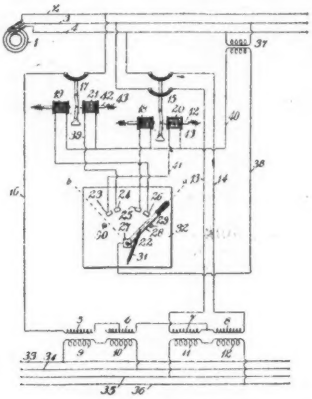
The process of preparing the paste consists in mixing soft lead and an oxide of lead together with water and acetone, sulphate of ammonia and acetic acid.

917,794. TRANSFORMER SYSTEM. Karl C. Randall, Edgewood Park, Pa., assignor to Westinghouse Electric & Manufacturing Company, East Pittsburg, Pa. Filed July 6, 1908. Between a three-phase and two-phase circuit is a set of phasing transformers connected by switches electromagnetically controlled in a definite order from a teaser-transformer circuit.

917,795. ELECTROLYTIC CELL. James H. Reid, Newark, N. J. Filed December 28, 1908. Includes a receptacle having a hollow central electrode supplied with electrolyte and outer electrodes that can be rotated.

917,796. ELECTRIC FURNACE. James H. Reid, Newark, N. J. Filed December 30, 1908. Has a number of converging electrodes adapted to produce arcs between them, in combination with a sweep adapted to spread the ore on the electrodes and to clean it off of the same.

917,806. ELECTRIC MOTOR. Robert Siegfried, Pittsburg, Pa., assignor to Westinghouse Electric & Manufacturing Company. Filed May 22, 1905. The commutator end of the motor is housed in by two sheet-metal cover plates bolted and clamped together with their adjacent edges in any desired angular position with reference to the base of the motor.



917,794.—SWITCH CONNECTIONS FOR PHASING TRANSFORMERS.

917,830. SIGNALING SYSTEM FOR RAILWAYS. Max W. Zabel, Chicago, Ill. Filed April 13, 1907. Comprises a selective signal-receiving device for a number of sections of a railroad track and electric means associated with each section and controlled by the presence of cars therein to selectively operate the signals.

917,834. FARE-REGISTER. Robert C. Adams, New York, N. Y., assignor of one-half to Henry W. Brown, New York, N. Y. Filed October 26, 1907. Associated with a coin chute and a register for counting the coins passed, is an electromagnetically controlled means for obstructing the passage of each coin until it is registered.

917,858. CONTROLLER-FRAME. Hugo W. Forslund, Chicago, Ill., assignor to J. W. Reedy Elevator Manufacturing Company, Chicago, Ill. Filed December 14, 1906. An electric controller is mounted in a frame provided with insulating supports and clamps.

917,867. ARC LAMP. William G. Houskeeper, Wilkinsburg, Pa., assignor to Westinghouse Electric & Manufacturing Company. Filed July 9, 1906. Combined with the normally separated electrodes is an electromagnet for causing them to engage and a switch in a shunt to the magnet the movable member of which is provided with adjustable stops.

917,868. SYSTEM OF CONTROL. Henry D. James, Pittsburg, Pa., assignor to Westinghouse Electric & Manufacturing Company. Filed June 2, 1905. The motor has a master switch and switches for reversing the armature circuits, also relay switches that prevent interruption of the field circuit while the motor operates at a greater than predetermined speed.

917,875. METHOD OF MAKING ELECTRODES. Ernst W. Jungner, Kneippbaden, Sweden, assignor to Nya Ackumulator Aktiebolaget Jungner, Stockholm, Sweden. Filed June 23, 1906. Consists in subjecting a magnetic metal to electrolysis while surrounded by a substance that is but slightly soluble in the electrolyte and thus rendered semi-solid, removing the substance and subjecting the electrode to a charging current.

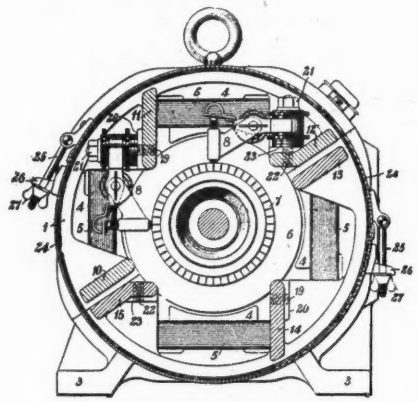
917,897. AUTOMATIC CONTROLLING MECHANISM FOR FLUID-PRESSURE SYSTEMS. Walter J. Richards, Milwaukee, Wis., assignor to National Brake & Electric Company, Milwaukee, Wis. Filed July 15, 1908. A step-by-step mechanism connected with the motor-compressor is adapted upon operation to change the resistance of the motor circuit.

917,898. CONTACTOR-COMMUTATOR FOR DYNAMO-ELECTRIC MACHINES. Henry R. Rivers-Moore and John M. Donald, London, England. Filed October 5, 1907. Comprises contactors movable radially to the commutator segments, a rotary member adapted to move the contactors gradually against the segments and springs for rapidly returning the contactors from contact with the segments.

917,916. TIME-RELAY FOR SELECTIVE SIGNALING. Harris A. Watson, Kendallville, Ind. Filed March 26, 1908. A relay drives a reciprocatory mechanism yieldingly connected with a switch so as to close it.

917,955. ELECTROMAGNETIC PUNCH. John J. Leidigh, Milwaukee, Wis. Filed September 10, 1906. An electromagnetic mechanism releases a spring-actuated ticket punch.

917,964. BRUSH-HOLDER. Alexander Rae, McKeesport, Pa., assignor to John F. Rae, McKeesport, Pa. Filed October 12, 1908. Comprises a base and head, links pivotally and slidably mounted on each and means for maintaining the links in electrical contact with both.



917,806.—COMMUTATOR HOUSING FOR SINGLE-PHASE MOTOR.

918,028. TRAIN-INDICATOR. Pasquino Ferrari, Fall River, Mass., assignor of one-tenth to Severino Toletti and one-tenth to Francesco Paolo Gizzi, Fall River, Mass. Filed February 18, 1907. Combined with two sets of indicators is a clock movement, electric circuits adapted to be opened and closed by the movement and a switch for throwing one set out of action and the other into action according as the clock is registering the hours before or after noon.

918,049. MACHINE FOR RESEATING VALVES. Robert H. Hazeltine, Ithaca, N. Y. Filed March 26, 1907. Provided with a rotary electromagnetic valve holder and mechanism for rotating it in reverse directions.

918,086. CIRCUIT-CONTROLLING DEVICE. Robert B. Patterson, Washington, D. C. Filed July 3, 1906. A switch with two pairs of terminals has bridge connections therefor and is operated by a toggle mechanism controlled by two solenoids.

918,102. SOCKET FOR INCANDESCENT LAMPS. William C. Tregoning, Cleveland, Ohio. Filed June 26, 1908. An insulating ratchet member for lamp sockets has a central hub with a bore and a pair of segmental opposite wings, spaced apart from each other.

918,108. MOLD FOR CASTING RAIL-BOND TERMINALS. William H. Wherry, Cleveland, Ohio, assignor to The Electric Railway Improvement Company, Cleveland, Ohio. Filed July 12, 1907. The mold is provided with a recess for receiving the end of the conductor forming the bond and a second recess adjacent thereto for forming the bond terminal.

918,119. ELECTRIC FIXTURE. William J. Boemper, Rutherford, N. J., assignor of one-half to Harry A. Muecke, New York, N. Y. Filed October 4, 1907. The base is slotted to fit to a molding. On the base is mounted a receptacle and socket containing electrical connections to the line wires and support terminals.

918,127. INSULATOR. Walter G. Clark, New York, N. Y. Filed July 27, 1906. Has a wire-receiving slot with a restricted opening leading thereto and shoulders at the junction of the slot and recess adapted to engage the wire-confining key.

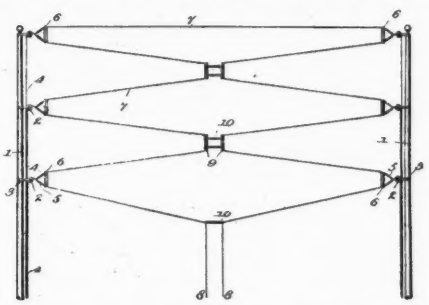
918,164. ALARM APPARATUS. William H. Kirnan, Bayonne, N. J. Filed December 21, 1908. Combined with a closed circuit signal wheel are a non-interfering magnet, a controller connected to its armature and actuated by the wheel and circuit contacts in series with the magnet and governed by the controller.

918,181. ELECTRIC FLASH-LIGHT ATTACHMENT. Frederick Meadows, Berkeley, Cal., assignor of one-half to Herbert B. Cornwell, Berkeley, Cal. Filed March 29, 1907. A small casing contains a lens, an incandescent lamp, and a spring switch connected by circuit wires with a pocket battery.

918,188. ELECTRIC CUT-OUT. Thomas E. Murray, New York, N. Y. Filed October 17, 1908. A fuse case is provided with two plugs, with a connecting piece between them, a pair of oppositely disposed contact plates on the outside of each plug and a fuse in each plug connected at its ends to these contact plates.

918,194. ELECTRIC AIR-COMPRESSOR. Augustine J. Pocock and Richard E. Allgire, Dayton, Ohio, assignors to the Platt Iron Works Company, Dayton, Ohio. Filed August 25, 1905. A motor-driven compressor has means for cooling the compressed air.

918,199. POLARIZED RELAY. Paul Ribbe, Halensee, near Berlin, Germany, assignor to Fern-Schnell-Schreiber Gesellschaft, Berlin, Germany. Filed January 28, 1909. Consists of a frame, a vertical leaf spring secured therein, an armature supported by the spring, two opposite electromagnets adapted to produce a differential action on the armature, a vertical rod and multiplying lever supported by the armature.



918,255.—ANTENNA ARRANGEMENT FOR WIRELESS TELEGRAPHY.

918,202. INCANDESCENT-LAMP CLUSTER. Frederick Schwartz and Leo Kleinmann, New York, N. Y. Filed February 26, 1908. A cluster block is equipped with several lamp sockets and an interior chamber having contacts arranged in two planes. The rotatable stem has two contact lobes for engaging either set of contacts.

918,208. TRANSMITTING APPARATUS. Harry Shoemaker, Jersey City, N. J., assignor to International Telegraph Construction Company. Filed December 23, 1905. A wireless-telegraph transmitting circuit includes two inductive resistances in series and another in series with an operator's key connected in parallel to one of these series coils.

918,221. STORAGE-BATTERY GRID. Willis M. Thayer, Hartford, Conn. Filed April 17, 1908. Consists of a number of flanged parallel supporting bars arranged so as to form longitudinal pockets between them, and posts connecting the bars at their ends.

918,223. ELECTRICAL FUSE. William H. Tidmarsh, Elgin, Ill. Filed May 31, 1907. The construction of an enclosed fuse having special end caps is described.

918,229. SIGNAL SYSTEM. John R. Walsh, Boston, Mass. Filed October 6, 1905. A station indicator for a car is provided with a number of movable sign plates, electrically-controlled pneumatic means for actuating each plate and a commutator to which each of the electrical control means is connected and by which its time of operation is governed.

918,235. MACHINE FOR REELING COVERED ELECTRIC WIRE FOR VULCANIZATION. Wilhelm Wendtland, New York, N. Y. Filed May 27, 1908. A wire-reeling machine has a rotary platform with spirally-arranged perforations, a radially-movable pinion engaging the perforations beneath the platform and a guiding device above the platform connected with the pinion.

918,254. ARRANGEMENT OF WINDINGS FOR ELECTROMAGNETIC CLUTCHES. Heinrich Ast, Vienna, Austria-Hungary. Filed December 26, 1908. The winding is completely sealed and protected by an insulated casing about which is a second casing fitted over the flanges or side pieces. The leading-in wires pass through tubes.

918,255. ANTENNA FOR WIRELESS TELEGRAPHY. Henry E. Athearn, Brooklyn, N. Y. Filed May 23, 1908. Between two masts is stretched a single wire formed into loops lying in a vertical plane.

918,256. HERTZIAN-WAVE METER. Clifford D. Babcock, New York, N. Y., assignor to the United Wireless Telegraph Company. Filed May 27, 1908. Combined with a pair of insulated metallic cylinders constituting a condenser is an inductance coil surrounding the cylinders, a sliding connection between the coil and the inner cylinder and a wave indicator connected to both of the cylinders.

918,257. STATIC CONDENSER. Clifford D. Babcock, New York, N. Y. Filed June 30, 1908. Comprises a casing provided with a dielectric in the form of a flat, hollow envelope having a conductor on its interior, a fluid on its exterior and means to adjust the level of the fluid.

918,262. METHOD OF FORMING JUNCTION AND FEEDING POINTS IN ELECTRICAL AERIAL DISTRIBUTION SYSTEMS. Hans Behrend, Südende, near Berlin, Germany, assignor to Siemens-Schuckert Werke, Berlin, Germany. Filed May 21, 1908. Consists in joining crossing cables of like polarity by means of a set of diagonal connectors lying in different planes and connected with a set of safety devices.

918,269. PROCESS FOR PRODUCING METALS. Henry S. Blackmore, Mount Vernon, N. Y. Original application filed September 23, 1904. Divided and this application filed September 24, 1907. Consists in electrolyzing a molten bath with an anode of calcium carbide, the bath containing a metal oxide and a salt, the anion of which will combine with the calcium of the carbide.

918,278. AUTOMATIC ELECTRIC FIRE AND HEAT ALARM. James W. Butterworth, Richmond, near Auckland, New Zealand. Filed February 24, 1908. The thermostatic device comprises a metal tube containing mercury, a plug closing the other end of the tube and provided with a terminal wire arranged within its bore, and means for connecting the tube and wire to the terminals of electric circuits.

918,287. TROLLEY DEVICE FOR ELECTRIC CARS. William A. Crawford-Frost, Baltimore, Md. Filed October 13, 1908. A trolley pole for use with low-hanging trolley wires consists of a hinged pair of vertical and horizontal arms, the upper part bearing at right angles to the wire and secured by springs.

918,291. KEYBOARD TRANSMITTER FOR MORSE AND OTHER TELEGRAPHIC CODES. Patrick B. Delany, South Orange, N. J. Filed July 10, 1903. Each finger piece has a contact device and a contact brush connected with a code-transmitting electromagnet.

918,292. TELEGRAPHY. Patrick B. Delany, South Orange, N. J., assignor to the Telepost Company of Maine. Filed May 22, 1905. In electrochemical telegraphy the process consists in initiating the formation of signals at the receiver by transmitting marking currents of given polarity and uniform duration.

918,293. TELEGRAPHY. Patrick B. Delany, South Orange, N. J. Filed May 24, 1905. There are means adapted to close a gap in a local circuit during a period of time required for automatic formation of a succession of dot signals.

918,294. AUTODOT TRANSMITTER. Patrick B. Delany, South Orange, N. J. Filed June 21, 1906. Consists of an electromagnet, its armature lever, and a loosely-mounted sliding impact weight set into motion by the latter.

918,303 and 918,304. SOUND-REPRODUCING APPARATUS. Willis O. C. Ellis, near Greenfield, Ohio. Filed December 23, 1908. A record-actuated device produces relative movement between two adjustable contacts and a circuit is connected with the contacts and includes a telephone receiver.

918,306. METHOD OF WIRELESS SIGNALING. Reginald A. Fessenden, Brant Rock, Mass. Filed July 1, 1907. The method of eliminating disturbing impulses comprises generating waves having a definite frequency, in groups having a definite group frequency about 1,000 per second, and receiving the same with an indicator resonantly unresponsive to the group frequency.

918,307. APPARATUS FOR WIRELESS SIGNALING. Reginald A. Fessenden, Brant Rock, Mass. Filed August 25, 1908. The apparatus for utilizing the above method is described.

918,322. TELEGRAPH SYSTEM. George E. Hines, New York, N. Y., assignor of one-half to William T. Daley, Brooklyn, N. Y. Filed July 30, 1908. There are two sources of current, one for sending induced impulses and the other for sending direct-current impulses, a key for controlling the former and commutating the latter ones, and a second key for interrupting both kinds of impulses, one kind at a time.

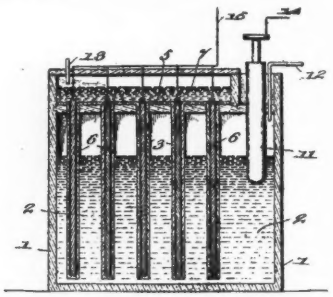
918,339. SYSTEM OF INSULATION FOR HIGH-VOLTAGE ELECTRIC CONDUCTORS. Fred M. Locke, Victor, N. Y. Filed April 9, 1907. Consists of a support, an insulator thereon, a frame supported on the insulator, and a second frame supported from the first one, the latter frame having two insulators attached thereto, one between the frames.

918,353. SWITCH. Lembert H. Moulthrop, Bridgeport, Conn., assignor to the Perkins Electric Switch Manufacturing Company, Bridgeport, Conn. Filed September 10, 1908. Discloses details of a push-button wall switch.

918,369. ADVERTISING DEVICE. Samuel Richard and Fred Gluck, East Pittsburg, Pa. Filed September 16, 1907. A pair of parallel motor-driven shafts carry signs behind an opening illuminated by electric lamps.

918,370. APPARATUS FOR THE ELECTROLYTIC DECOMPOSITION OF ALKALI-CHLORID SOLUTIONS BY MEANS OF MERCURY CATHODES. Johan J. Rink, Copenhagen, Denmark. Filed May 4, 1906. Combined with a tank having a bottom layer of mercury is a washing box connected with the tank by means of pipes and having upright wire nettings down which the amalgam flows and electro-negative plates between the nettings.

918,377. TROLLEY GUARD. Green W. Sandiford, Mobile, Ala., assignor of one-fourth to Joseph R. Tapia and one-fourth to J. I. Clemmons, Mobile County, Ala. Filed October 5, 1908. The trolley pole has a sliding member mounted therein, a rack bar and trolley mounted on the member, and a guard with a gear adapted to engage the rack whereby the guard is actuated on the movement of the member.



918,257.—ELECTRIC CONDENSER.

918,402. CONTROLLER FOR ELECTRICALLY-DRIVEN AUTOMOBILES. Ansbert Vorreiter, Berlin, Germany. Filed April 23, 1907. Consists of two hand levers and two pedals associated with a switching drum and brake.

918,413. BURGLAR ALARM. William T. Anderson, Jr., Tarentum, Pa. Filed April 29, 1908. One of the treads in a stairway is hinged to the riser and adapted to close an alarm circuit when stepped upon.

918,417. AUTOMATIC ALTERNATING-CURRENT CONTACT APPARATUS. Charles E. L. Brown, Roemerburg, Baden, Switzerland. Original application filed November 7, 1903. Divided and this application filed August 27, 1906. Combined with two electromagnets, one in one of the conductors of a three-phase circuit and the other between the remaining two conductors, is a disc mounted to rotate between the magnets, terminal contacts and a flexible suspension adapted to be wound up by the disc.

918,419. PROCESS FOR PRODUCING CARBIDES. Remo Catani, Rome, Italy. Filed January 15, 1906. Calcium carbide compounds are made by coating the carbon with slaked lime and placing it and also slaked lime into an electric furnace, the electrodes in which are also coated with slaked lime.

918,425. METHOD OF BENDING METAL STRIPS EDGEWISE. Gano S. Dunn, East Orange, N. J., assignor to Crocker-Wheeler Company, Ampere, N. J. Original application filed November 16, 1905. Divided and this application filed November 28, 1906. The method of forming non-circular continuous edgewise copper coils consists in curling upon a mandrel successive convolutions, the material forming each one being bent through arcs, the sum of which exceeds a circle, and then releasing before the succeeding coil is formed.

918,434. SWITCH. Giovanni Gaglio and Luigi Villani, Milan, Italy. Filed November 2, 1907. An electric time-switch-operating mechanism comprises a switch having an overturning device provided with a variable counterpoise and rotatable frictional means movable into engagement with a part of the overturning device for actuating it.

918,439. ELECTRIC PROCESS FOR GASSING THREADS. Gustave Gin, Paris, and Victor Courtecuisse, Lille, France; said Courtecuisse assignor to said Gin. Original application filed March 22, 1907. Divided and this application filed September 11, 1907. Consists in singeing a thread by proximity to electrically heated surfaces and simultaneously blowing an air blast upon the surfaces and thread.

918,455. COIN-CONTROLLED APPARATUS. Frank Magidson, Irwin, Pa., assignor to Westmoreland Automatic Machine Company, Irwin, Pa. Filed April 25, 1907. The passage of a coin between two terminals closes a motor circuit which is then automatically broken.

918,477. INCANDESCENT-LAMP SOCKET. Frank E. Seeley, Bridgeport, Conn., assignor to the Bryant Electric Company, Bridgeport, Conn. Filed April 21, 1908. The key consists of a rotary spindle and a contact piece carried thereby having an external conducting band, a shell within this and an interposed insulating envelope.

918,487. SOUND-REPRODUCING APPARATUS. Willis O. C. Ellis, near Greenfield, Ohio. Filed January 31, 1908. A modification of Patent Nos. 918,303 and 918,304.

918,489. AUTOMATIC SWITCH FOR LIGHT AND POWER CIRCUITS AND THE LIKE. Patrick H. McCormack, New York, N. Y. Filed March 17, 1908. Comprises an operating magnet and armature arranged to operate main contacts, auxiliary contacts and cut-out, and to permit return movement of the armature without operation of the main and auxiliary contacts.

REISSUE.

12,940. SIGNAL-LIGHT APPARATUS. Gustaf Dalén, Stockholm, Sweden, assignor to Aktiebolaget Gasaccumulator, Stockholm, Sweden. Filed February 19, 1909. Original No. 857,035, dated June 18, 1907. A valve controlling the flow of gas is provided with magnetic means for holding it in one position and means actuated by the pressure of the gas for overcoming the power of the magnet so as to actuate the valve suddenly.

PATENTS THAT HAVE EXPIRED.

Following is a list of electrical patents (issued by the United States Patent Office) that expired April 20, 1909:

472,982. CONDUIT AND TROLLEY FOR ELECTRIC RAILWAY SYSTEMS. C. W. Carll and J. W. Phillips, Trenton, N. J.

473,003. HEATING AND WELDING BY ELECTRICITY. H. Howard, Halesowen, near Birmingham, England.

473,024. DISTRICT TELEGRAPH BOX. C. Selden, Baltimore, Md.

473,042. ELECTRIC CLUTCH. P. W. Willans, London, England.

473,044. CONDUIT FOR ELECTRIC WIRES. C. H. Wilson, Chicago, Ill.

473,061. ELECTRIC LOCK. C. H. Crockett and C. C. Allen, Boston, Mass.

473,077. ARMATURE-CORE FOR ELECTRIC MOTORS. D. Pepper, Jr., Philadelphia, Pa.

473,117. ELECTRODE FOR USE IN ELECTRO-METALLURGICAL PROCESSES. P. Heroult, Lauffen, Switzerland.

473,118. APPARATUS FOR PRODUCING ALUMINUM OR OTHER METALS. P. Heroult, Lauffen, Switzerland.

473,121. ELECTRICAL ANNUNCIATOR. T. W. Lake, Boston, Mass.

473,132 and 473,134. ELECTRIC SWITCH. F. H. Soden, Chicago, Ill.

473,146 and 473,147. SECONDARY BATTERY. H. E. Dey, New York, N. Y.

473,174. ELECTRIC INDICATING SYSTEM AND INSTRUMENT. H. J. Haight, New York, N. Y.

473,228. ELECTRIC SWITCH. E. H. Johnson, New York, N. Y.

473,253. CONVERTER SYSTEM FOR ELECTRIC RAILWAYS. M. W. Dewey, Syracuse, N. Y.

473,282. CUT-OFF FOR ELECTRICAL MACHINES. J. P. Wooley, Simcoe, Canada.

473,288. ELECTRIC RAILWAY SIGNAL. J. M. Brasington, Morven, N. C.

473,341. ELECTRIC ODOMETER AND SPEED INDICATOR. W. A. Phillips, United States Army.

473,363 and 473,364. ARMATURE FOR DYNAMO-ELECTRIC MACHINES. S. H. Short, Cleveland, O.

473,365. GEARLESS MOTOR FOR ELECTRIC RAILWAY CARS. S. H. Short, Cleveland, O.

473,366. ARMATURE FOR ELECTRIC GENERATORS OR MOTORS. S. H. Short, Cleveland, O.

473,367. DYNAMO-ELECTRIC MACHINE. S. H. Short, Cleveland, O.

473,368. GEARLESS PROPELLING MECHANISM FOR ELECTRIC RAILWAY CARS. S. H. Short, Cleveland, O.